

Missing Academic Targets in Ninth Grade: Do Early College High Schools Give Students Second Chances for College?

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Abstract:

Advancing in key courses in ninth grade is an early, crucial step in preparing for college. Students who miss academic targets early in high school may not be ready to go to college 4 years later. In the United States, when students fail key courses in ninth grade, they may struggle to catch up to their peers who successfully took and passed these required courses. Even if they graduate high school with a good GPA, if they have not taken all required courses, they will not be eligible to attend college. This paper explores whether a comprehensive high school reform model—early college high schools—can mitigate poor ninth grade performance. Early colleges couple a rigorous academic experience with extensive student supports. This study examines whether early colleges are more effective in having students advance in key ninth grade courses, and when students do not advance, whether these schools are more effective in helping those students recover. These analyses are part of a statewide quasi-experimental study of early colleges in North Carolina. We find that some students did miss the college-readiness target by failing to advance in ninth grade English or mathematics courses. In early colleges students who missed their target in ninth grade were more likely to recover by advancing in college preparatory classes, graduate, and enroll in college.

Keywords: college access | school reform | disadvantaged students | early college

Article:

Introduction

In the United States, academic success early in high school sets a foundation for students to enroll and succeed in postsecondary education. Ninth grade academic performance is strongly associated with graduating from high school (Allensworth & Easton, 2005, 2007; Roderick et al., 2014), and with students’ likelihood of enrolling in college (Easton et al., 2017; Long et al., 2012; MacIver & Messel, 2013). Advancing in key ninth grade courses by both taking and passing them is essential because many 4-year colleges require the completion of a core set of academic courses in high school. If students do not take and pass those courses by the end of ninth grade, they are highly unlikely to complete all required courses by the end of high school (Finkelstein & Fong, 2008). If

students do not complete these required core classes, they will not be eligible to enroll in college even if they get good grades in the courses they do take.

In light of the importance of ninth grade achievement, American schools have been paying more attention to the ninth-grade experience. To improve students' ninth-grade performance, educators have undertaken a variety of strategies that provide academic and social supports to students (Dynarski et al., 2008). Yet, despite these efforts, academic failures still occur.

This study explores the extent to which a comprehensive high school reform model effectively reduced the likelihood of failing a key ninth grade class, and, for students who still failed, whether it then mitigated the potential negative long-term impacts of doing so. Many studies of academic performance in ninth grade have focused on specific cities (see e.g., Allensworth & Easton, 2005, 2007; Roderick et al., 2014; MacIver & Messel, 2013), but this study focuses on a program being widely implemented across the state of North Carolina, with over 100 schools in urban, suburban, and rural locations. The reform model in this study, the early college high school model, combines the high school and college experiences, while providing extensive supports to students.

In North Carolina, the early college high school model is designed to help students complete high school, prepared to enroll and succeed in college. All students in early college high schools enroll in college preparatory classes beginning in ninth grade. In addition to these curricular requirements, early college high schools have a purposeful design that uses personalized instruction to help students succeed in the transition to high school and beyond. Other research on these schools indicates that students in ninth grade do succeed academically compared with their peers in traditional schools (Berger et al., 2013; Edmunds et al., 2012; Edmunds, Arshavsky, et al., 2017; Edmunds, Unlu, et al., 2017; Haxton et al., 2016; Lauen et al., 2017).

Even with these school successes, some students in early college high schools miss the target for college readiness. They fail to advance in key ninth grade English and mathematics courses, which makes it harder for them to become eligible for college in within 4 years. This paper uses longitudinal data to follow their progress in high school and college to address the following questions:

1. Are early college high schools more effective in preventing students from failing to advance in key ninth grade classes than traditional schools?
2. For students who fail key ninth grade classes, are early college high schools more effective in helping them recover than traditional schools in terms of school engagement, taking college preparatory courses, and earning a college degree?

Ninth Grade Performance Predicts Future Success

The transition to high school is a pivotal point for adolescents that may establish lifelong consequences. Changing schools from middle to high school is a normal transition; most students change schools between eighth and ninth grade. For some students, this change has been associated with a reduction in academic achievement, which persisted throughout their educational careers (Reyes et al., 2000). In Chicago, of students who failed a core ninth grade course, just over half were identified as “moderate risk” or “low risk” based on their eighth-grade performance. These students lost academic ground during the transition to high school (Allensworth et al., 2014). Academic achievement in ninth grade is critical for completing high school. In Chicago, students who failed no more than one semester in a core course and met requirements to progress to tenth

grade were 3.5 times more likely to complete high school than those who did not (Allensworth & Easton, 2005; Allensworth et al., 2014). In another study, academic growth curves in the first 3 semesters of high school accounted for 92% of dropouts (Bowers & Sprott, 2012). In Baltimore, MD, ninth grade failure of a core course along with chronic absence and out-of-school suspensions were associated with high school dropout, even when controlling for eighth grade academic performance (MacIver & Messel, 2013). In New York City, earning at least 10 credits in ninth grade combined with having passed a Regents exam was a reliable predictor of on-time graduation with a Regents Diploma (Kemple et al., 2013).

Regardless of academic performance, if students do not take a set of core academic classes, they will not be eligible for college. In California, Finkelstein and Fong (2008) found that in each different demographic group studied, those who took Algebra I in ninth grade were much more likely to complete the courses needed for college, compared with those who had not taken Algebra I in ninth grade. For example, 37% of Blacks who took Algebra I in ninth grade completed all college preparatory requirements compared with 5% of Blacks who did not take Algebra I in ninth grade. In each comparison, differences were statistically significant.

Ninth grade academic performance is associated with post-secondary outcomes as well. In a study of 129,389 Florida ninth grade students, those who took at least one rigorous mathematics course in the early high school grades had higher graduation and 4-year college enrollment rates than those who did not take such courses. For rigorous course takers, the high school graduation rate was 9.5 percentage points higher, and the 4-year college enrollment rate was 10 percentage points higher than for those who had not taken a rigorous math course in early high school (Long et al., 2012). In Baltimore, ninth grade GPA was associated with college enrollment (MacIver & Messel, 2013). All of these studies indicated that the courses students take in ninth grade are critical for long-term student success.

Conceptualizing College Readiness

To be eligible to attend college, students have to advance in required coursework in every high school grade beginning with ninth grade. While academic advancement is not the only required step to college enrollment, it is essential. Klasik (2012) found that students with strong academic performance early in high school were much more likely than those with poor academic performance to complete all of the steps of the college admissions process. To succeed in college, students must have background knowledge and learning skills. By succeeding in college preparatory work throughout high school, students gain the necessary knowledge and skills.

This study focuses on successful completion of core college preparatory courses in ninth grade because these are make-or-break indicators—students who do not successfully complete these key courses may not be eligible to enroll in college regardless of their performance in other areas. Students may miss these academic courses if they fail the subject or if they simply do not enroll in these courses. Although failing to meet academic requirements in any grade reduces the likelihood of going to college, ninth grade sets the stage for the rest of the high school experience, and missing ninth grade academic targets may put students behind for the rest of high school. For example, one study found that only 6% of students who had not taken Algebra I in ninth grade completed the courses needed for college (Finkelstein & Fong, 2008).

In our study, we use a definition of college readiness that builds on the research above and relies on the coursetaking expectations of the University of North Carolina (UNC) system. The UNC System requires that entering students have taken and passed at least four mathematics

(Algebra I and higher) and four English (English I and higher) courses. This means that students need to take and pass these courses in ninth grade; if they do not, they will struggle to find time in high school to take all of the required classes. Admission to the university system requires multiple courses in science or social science, but students could meet those requirements without having taken any of them in ninth grade. Therefore, our measure of college readiness, that is, being on target for college in ninth grade, focuses on the required ninth grade courses: mathematics and English. Appendix 1 presents the courses a high school student needs to take to be eligible for admission to the University of North Carolina system.

School Practices

Recognizing the importance of ninth grade courses, educators and policy makers have undertaken different initiatives to help students prepare for high school graduation and college success, including many initiatives to have students take a core set of college preparatory courses. However, programs focused on a college preparatory curriculum for all do not always lead to achievement growth for all students. In Chicago, under a college preparatory program for all students, more students did complete ninth grade with credits in Algebra and English I, but failure rates increased, test scores did not improve, and students were no more likely to enter college (Allensworth et al., 2009).

Research suggests that students do better when they receive supports in addition to these academic requirements. A research synopsis identified studies of the effectiveness of dropout prevention programs that meet What Works Clearinghouse standards and reported that schools can assist students by using data systems to identify at-risk students, assigning adult advocates to students, providing academic support and enrichment, implementing programs targeted to student behavior, personalizing the learning environment, and providing rigorous and relevant instruction (Dynarski et al., 2008).

In particular, targeted supports in ninth grade can help students succeed in that year and subsequently. A study of 24,894 ninth grade students in Chicago found ninth-grade course performance was better in schools with strong student-teacher relationships and where students saw high school as relevant to their future (Allensworth & Easton, 2007). Also in Chicago, when school policies focused on helping students succeed in ninth grade, the percentage of students in those schools who succeeded in ninth grade increased, and subsequently, their graduation rates increased dramatically. When schools increased the percentage of students who completed core courses in ninth grade by 10 percentage points, schools saw a subsequent increase in high school graduation rates (Roderick et al., 2014).

Beyond ninth grade, additional academic and non-academic student supports help students become ready for college in terms of academics as well as understanding the process for applying to and enrolling in college. In Philadelphia, educational encouragement programs that provided academic support and counseling had a positive influence on both high school graduation and a suggested positive influence on enrollment in postsecondary educational institutions for first generation college goers (Furstenberg & Neumark, 2007). A national study of whole-school precollege access programs showed participants were more likely to seek information about college opportunities, to apply to college, and to receive financial aid than nonparticipants (Glennie et al., 2014).

Early College High Schools

Many of these practices are incorporated into a comprehensive model called early college high schools. In the United States, early college high schools are a comprehensive school reform model designed to prepare all students for enrollment and success in postsecondary education. Frequently located on the campuses of postsecondary educational institutions, early college high schools blend high school and college experiences to provide an academically rigorous course of study accompanied by extensive student supports. Most early colleges are located on 2-year college campuses, but some are located on 4-year campuses. Because these high schools are located on the campuses of postsecondary educational institutions, students have many choices of college courses to take, and they learn how to use college resources, such as libraries or labs. Particularly for first generation college-goers, through spending high school on a college campus, it may be easier to see themselves as college goers, which would hone their plans to pursue additional education. Students attending these schools should be able to graduate with a high school diploma and 2 years of university transfer credit or an associate degree. These small high schools are intended to target students who are typically underrepresented in the college-going population, such as students who are first-generation college-goers, students from low-income families, and those who are members of a minority group underrepresented in college.

Each early college is expected to implement and exhibit a specific set of design principles that represent characteristics of high quality high schools (see North Carolina New Schools, 2013). Three of these design principles are intended to directly impact students' readiness for college:

1. Ensuring that students are ready for college This includes making sure all students take a sequence of college preparatory courses that meet the admission requirements for the University of North Carolina system. Students are also required to take college-level courses that either lead to an associate degree or in a sequence that supports a career pathway. Finally, teachers are expected to provide explicit instruction in college readiness skills (e.g., time management, note taking). Traditional high schools provide academic support for students who perform poorly in class, such as after-school tutoring or small-group instruction for those who need help. However, some teens may not take advantage of these opportunities, either because of other after-school obligations or because they do not want to be singled out. Early colleges operate under the assumption that teachers should proactively recognize when students need assistance and make that assistance available to all students. Early college supports included monitoring students' performance and intervening with tutoring or assigning students to study groups when students were performing poorly.
2. Instilling powerful teaching and learning in the schools Teachers are expected to design rigorous instruction that ensures the development of critical thinking, application, and problem solving skills. Most of the high school courses are taught at the honors level, which requires students to do more advanced academic work. Although instruction varies by subject and course, teachers design rigorous instruction that gives students opportunities for critical thinking, application, and problem solving. As described by one teacher,

In all of our courses we are expecting students to read and write above grade level because just writing in ninth grade is not going to get you successful in a college course. They read and write in every class. My math class is structured where it's not -- solve equation one, solve equation two...Here's a scenario. How would you

write an equation? What does this mean? It’s deep higher-level thinking, thinking deeper about concepts” (Edmunds, Arshavsky, et al., 2017; Edmunds, Unlu, et al., 2017).

3. Providing high student/staff personalization. High-quality staff-student relationships are a key characteristic of the model. Given the rigorous curriculum, all early colleges provide students with robust academic, emotional, and social supports to help them succeed. These schools are often small, with fewer than 100 students in each grade, which permits establishing higher quality student–teacher relationships. Research has shown that school staff make concerted and purposeful efforts to engage students in school, and such “mandated engagement” is linked to more academic and affective support and better relationships with teachers and students (Edmunds et al., 2013). One early college student said,

Basically all the staff in the early college, they were so helpful. Definitely, I feel like they were part of my family sometimes. They did their work to the best of their ability. They’re also very caring.

Students anywhere can face personal struggles during high school, but in the early college, having strong relationships with their teachers helps students navigate school even when they face challenges.

The model also includes design principles that support ongoing professional development and collaboration among faculty; leadership that promotes a common vision centered on college readiness; and the use of time and resources to support the other design principles. Figure 1 below presents a conceptual framework of the components of the early college model most directly focused on college readiness.

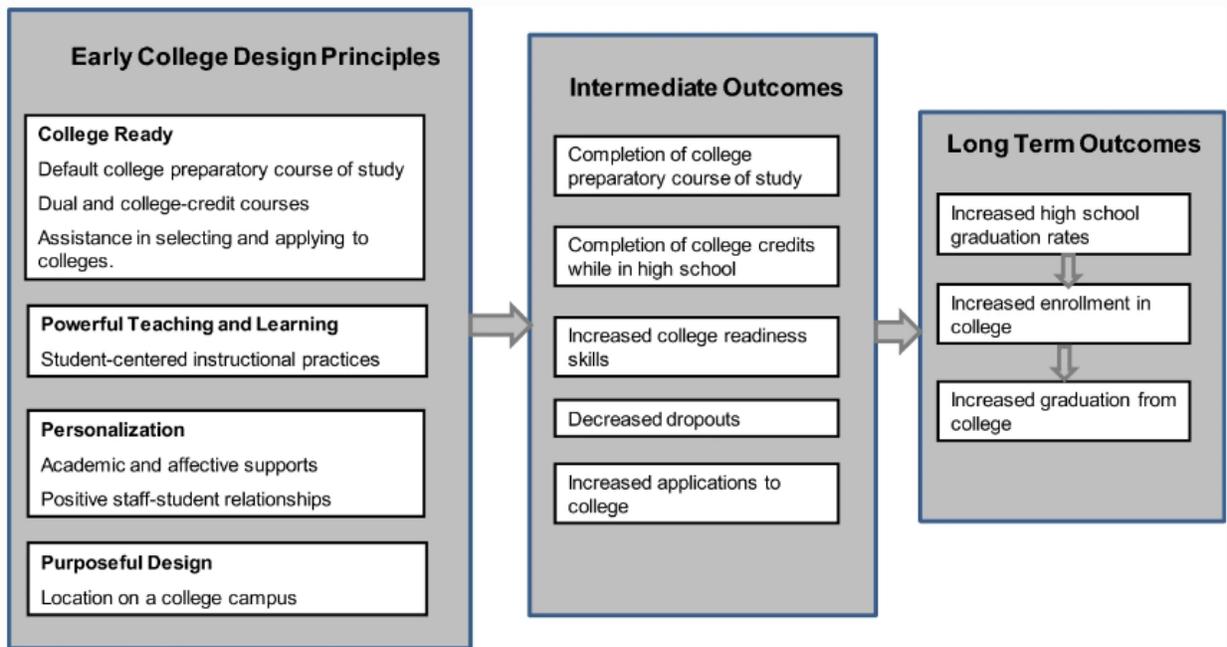


Figure 1. Early college design principles and desired outcomes

Focusing specifically on the ninth grade, all early college students are expected to take honors-level college preparatory courses and, in many schools, may also take a college course. The transition to high school and its more rigorous coursework are already challenging for many students (Benner, 2011) and the more rigorous expectations of the early college high school can make that transition more challenging.

The early college model not only requires that students take a college preparatory curriculum, but also emphasizes extensive academic and social emotional supports for students (Edmunds, Arshavsky, et al., 2017). Research has found that ninth grade early college students reported receiving more academic supports, such as tutoring and extra assistance. They also reported that their teachers cared about them and wanted to help them—and that they would not have had the same level of encouragement or support in a traditional high school. Students in early colleges also described positive relationships with peers. As early colleges are small schools, students get to know their classmates, and some described school activities designed to help them connect with each other (Edmunds et al., 2013). Other studies have concluded that the early college high school is a personalized learning environment. In a case study of an early college high school in North Carolina, Thompson and Onganga (2011) found that students felt their teachers cared for them as people—not just academically. Being in a small school gives teachers and students time to get to know each other better than they would in a larger school. Similarly, a study of a middle college high school found that teachers had adopted roles of teacher-mentor-counselors taking responsibility for the emotional and academic development with their students (Cullen, 1991). Teachers in early college high schools had a shared vision. Teachers reported having a strong sense of collaboration and shared goals (Kaniuka & Vickers, 2010). Compared with other high school reform models, North Carolina's early college high schools better implemented practices associated with ninth-grade math requirements and staff-student relationships (Arshavsky et al., 2014). Early colleges not only require students take college preparatory classes, but also foster strong staff-student relationships that can help students through these more demanding courses. These protective factors may help early college students succeed in the transition to high school.

In fact, much research on academic outcomes for early college students indicates that, on average, these students are more likely to succeed academically than similar students in traditional schools, and their success begins in ninth grade. A randomized longitudinal study of 1609 early college students in North Carolina found that early college students had higher rates of taking Algebra 1 in ninth grade (9.7 percentage point difference); they had fewer absences (– 1.3 days), and fewer out-of-school suspensions (6 percentage point difference). These differences were statistically significant (Edmunds et al., 2012). Another experimental study used a retrospective experimental design for a sample consisting of 10 sites across the country that used lotteries to select their students and found that early college students had an 86% graduation rate, which was significantly higher than the 81% for comparison students (Berger et al., 2013). A quasi-experimental study of 49,209 students found that early college students had higher scores in English I and Algebra I, fewer absences, and a higher high school graduation rate. All differences were statistically significant (Lauen et al., 2017). Similarly, in a study comparing one early college high school to two traditional schools within the same district found that after 1 year of implementation, early college students achieved higher scores on standardized tests and had lower suspension rates than matched comparison group students, though they did not find statistical differences in attendance (Munoz et al., 2014).

Research has demonstrated academic success for early college high school students beyond high school, and these differences between early college and traditional students are statistically

significant. Edmunds, Unlu, et al. (2017)) found 6 years after beginning ninth grade, 89.9% of early college students enrolled in postsecondary education, but only 72.2% of the control group had. During this time, 31.1% of early college students earned a postsecondary credential, but only 4.2% of the control group had. Similarly, Haxton et al. (2016) found that 6 years after ninth grade, 80% of early college students enrolled in college as opposed to 71% of comparison students. Twenty-four percent of early college students earned a college degree as opposed to 2% of comparison students. Similarly, Lauen et al. (2017) found that within 3 years of high school graduation, 15% of early college students attained an associate degree, compared with 3% of comparison students. Early college students also had higher rates of enrolling in a North Carolina public 4 year college than comparison students did. This study examines whether the early college program has the same kinds of benefits even for students who miss academic targets in ninth grade or whether students who do not progress in ninth grade are unable to meet subsequent early college demands.

Some early college high school students either did not take or did not pass college preparatory mathematics and English classes in ninth grade. Given the requirements for admission to the University of North Carolina system, advancing in both these courses in ninth grade is a clear target for those who plan to go to college, and we define those who did not advance in English or mathematics as off target for going to college. This study determines whether early colleges are more effective in keeping students on target for college and in helping those who do not advance in these key courses get back on target for college.

Research Design

These analyses address two research questions:

4. Are early college high schools more effective in preventing students from failing to advance in key ninth grade classes than traditional schools?
5. For students who fail key ninth grade classes, are early college high schools more effective in helping them recover than traditional schools in terms of school engagement, taking college preparatory courses, and earning a college degree?

To address these questions, we use longitudinal data on seven cohorts of North Carolina's high school students using a quasi-experimental design. This quasi-experimental design relies on propensity score weighing to ensure that early college participants and non-participants are similar.

Sample and Methods

The study sample includes seven cohorts of students, those who enrolled in high school starting in 2005–2006 through 2011–2012. Of these students, 17,708 ninth grade students enrolled in early colleges while 691,883 attended traditional high schools.

Both research questions involve comparing background characteristics and high school outcomes of students who attended early colleges and those who attended traditional high schools. When making these comparisons, we needed to account for the fact that early colleges are schools of choice; that is, students self-selected into these schools, and not all traditional students applied to the early college. Those who sought to enroll in early colleges may have had different motivational and cognitive characteristics as well as parental involvement and support than

students who did not apply to these schools. In addition, the two types of students may have been raised in different neighborhoods and had different elementary and middle school experiences. For instance, early college applicants may have had more academic support during middle school that helped them prepare for high school and pursue postsecondary education thereafter. In addition, some early colleges used a screening process to choose students who meet their enrollment priorities. Therefore, we expected to have differences between students who attended early colleges and regular high schools.

In fact, descriptive statistics of early college and traditional high school students do suggest that it would be misleading to directly compare early college and traditional high school students' off/on target status in ninth grade and their subsequent outcomes. We addressed this problem by implementing a propensity score weighting procedure that assigned weights to the traditional high school students so that their demographic characteristics and eighth grade academic measures look like the early college students. Table 1 shows the unweighted and weighted means for all measures included in the propensity score matching process for both the early college high school and the non-early college high school group. The unweighted means were calculated before the propensity score matching, and the weighted means were calculated after the propensity score matching. Indeed, the first four columns of Table 1 show sizeable and statistically significant differences in demographic characteristics such as race/ethnicity, gender, disability status, gifted status, eligibility for free/reduced price lunch as well as academic measures from eighth grade such as test scores in English and math end of grade exams, passing Algebra I, and attendance. Specifically, this table shows that early college students were more likely to be female, identified as gifted, eligible for free/reduced price lunch, and had better academic outcomes in eighth grade, which reflect the aforementioned differences between the two groups.

These propensity score weights were calculated as follows. First, we estimated a logistic regression model with a 0/1 dependent variable (1 = early college students and 0 = traditional high school students) and with the aforementioned demographic variables and eighth grade academic outcomes as the independent variables. Using the estimated coefficients of the logistic model, we then calculated propensity scores for each student, which reflected their probability of being in the early college group. Following Stuart (2010), early college students were weighted by 1, and traditional high school students were weighted by $P^{\wedge} / 1 - P^{\wedge}$ (i.e., odds of selection) where P^{\wedge} is the estimated propensity score. An advantage of weighting over other propensity scoring approaches (such as matching) is that the analysis retains all early college and traditional high school students. (Appendix 2 presents the statistical model specifications used in the analyses.)

The last four columns of Table 1 show that this weighting procedure worked in the sense that the weighted averages of the demographic characteristics of the early college and traditional high school students are very close, and none of the differences between the two groups is statistically significant. Therefore, we used these weights in all analyses when comparing the two groups. That is, to address research question 1, we compared the weighted percentages of early college and traditional high school students who are on and off target. In addition, the analyses that compare outcomes of off-target early college and traditional students to address research question 2 were conducted using multivariate regression models that used the propensity score weights and controlled for the students' cohort, demographic characteristics and eighth grade academic measures as covariates.

An alternative approach to address the second question could entail conducting a separate propensity weighting procedure only for the students who were off target in ninth grade in early colleges and traditional high schools. We did not implement this approach (which is essentially

Table 1 Weighted and unweighted means for early college and non-early college groups

	Unweighted statistics (before PSM)				Propensity score weighted statistics (after PSM)			
	ECHS Mean (1)	Non-ECHS Mean (2)	P val for (1)–(2) Diff	Effect size for (1)–(2) diff	ECHS Mean (1)	Non-ECHS Mean (2)	P val for (1)–(2) diff	Effect size for (1)–(2) diff
Black	25.6%	28.8%	0	– 0.071	25.6%	25.5%	0.86	0.002
Hispanic	10.5%	8.4%	0	0.075	10.5%	10.3%	0.508	0.007
Male	39.2%	50.9%	0	– 0.234	39.2%	39.3%	0.893	– 0.002
Have disability	4.5%	11.8%	0	– 0.228	4.5%	4.5%	0.85	0
Gifted	21.4%	17.0%	0	0.117	21.4%	21.6%	0.486	– 0.005
Economically disadvantaged	50.9%	44.8%	0	0.123	50.9%	50.0%	0.014	0.018
8th grade Math Scale Score (z-score)	30.2	23.8	0	0.15	0.302	0.305	0.283	– 0.007
8th grade Reading Scale Score (z-score)	0.357	0.026	0	0.334	0.357	0.365	0.207	– 0.008
Passed Algebra 1 in 8th grade	0.392	0.023	0	0.375	0.392	0.399	0.249	– 0.007
Average number of absences 8th grade	7.0	8.041	0	– 0.122	7.026	6.994	0.526	0.004

exact matching on on-target status in ninth grade) because it would account for the differences in the experiences of the early college and traditional high school in ninth grade, which may influence the subsequent outcomes. Our approach, on the contrary, allows any differences (positive or negative) in the ninth-grade experiences of the two groups of students to be reflected in their subsequent outcomes, thereby, providing a more complete assessment than the alternative approach of whether early college high schools are more effective in helping off-target students recover than traditional schools.

It is possible that the groups still have unobserved or unmeasured differences that may confound our analyses, but the propensity score weights and the regression models account for these observed differences between the contrasted groups.

Data and Measures

The North Carolina Department of Public Instruction (NCDPI) collects academic data about students, which qualified researchers may obtain through the North Carolina Education Research Data Center at Duke University. The North Carolina Education Research Data Center linked that data to our application lottery data so that we could analyze outcomes for early college and comparison groups. Of those who graduated high school, we linked their records to the National Student Clearinghouse to obtain information about enrolling in postsecondary educational institutions and earning a degree. Measures in the analyses include (1) being off target for college in ninth grade, (2) factors associated with getting off target, and (3) outcomes for off-target students.

Off target: We identified students who were off target as those who had not advanced in the core college preparatory mathematics or English courses by the end of ninth grade. These courses included Algebra I or higher and English I or higher. To advance in a course, a student had to have both taken the course and passed it with a D or better. Using transcript data from NCDPI, we determined whether students had taken and passed these courses and then categorized students who did not take or who took and failed at least one of these classes as off target. We treated off target as a dichotomous indicator noting whether or not the student became off target for college by the end of ninth grade.

Factors associated with being off target: Factors associated with getting off target include demographic characteristics and eighth grade academic proficiency. Models controlled for factors associated with getting off target, which included demographic characteristics and indicators of academic readiness for high school. Demographic factors include sex, coded 1 for male (with “females” as the reference category); race/ethnicity, coded 1 for black and 1 for Hispanic (with “Whites”, “Asians”, and “Others” as the reference category); and economic disadvantage, coded 1 for if the student was eligible for free or reduced-price lunch (with “not eligible for either” as the reference category).

We expected these demographic factors would be associated with getting off target for college due to national reports about students’ performance on eighth grade assessments by subgroup. The National Assessment of Educational Progress (NAEP) is the only nationally representative, continuing assessment of American students’ knowledge in various subject areas. In the 2013 eighth grade mathematics assessment, Black students’ average score was 28 points lower than that of White students, and Hispanic students’ average score was 17 points lower than that of White students. The average score for students who were eligible for free or reduced-price lunch was 25 points lower than that of those not eligible for free or reduced-price lunch (National

Center for Education Statistics, 2014). We also examined students' classification as academically gifted or as having a disability. These students may have received different school services, so we wanted to ensure treatment and comparison samples were balanced on these dimensions.

Academic readiness for high school included their eighth-grade achievement, specifically, scores on the state's end-of-grade exams in reading and mathematics and passing Algebra 1 in eighth grade. Those who performed poorly on end-of-grade examinations in eighth grade did not show sufficient command of knowledge and skills in these key subjects before beginning high school. The scale score for reading ranged from 327 to 384, with a passing cut score of 358, and the scale score for mathematics ranged from 332 to 386, with a passing cut score of 357. In presentations of results, scale scores were standardized and centered around zero. Students do not have to take Algebra I in middle schools, but those who are more mathematically proficient in seventh grade. Those who take Algebra I in middle school take the state's end-of-course exam. It is unlikely that a student who is academically ahead in math in middle school would miss ninth grade academic targets.

Outcomes. Our second research question pertains to what happens when a student gets off target for college in ninth grade in terms of engagement (absences and suspensions), college readiness (advancing in courses required for college entry) and educational attainment (high school graduation, postsecondary enrollment, and degree attainment). Because many of the early colleges operate as 5-year programs, all high school outcomes go through grade 13.

The engagement outcomes included absences and suspensions in any grade after ninth grade. Having high absences has been associated with dropping out of school (e.g., Allensworth & Easton, 2007). Here, we coded absences as the average days absent during high school. Suspensions have been found to have negative associations with achievement and positive associations with dropping out of school (Noltemeyer et al., 2015). We examined out-of-school suspensions, or instances where students are temporarily prohibited from attending school for disciplinary reasons. Suspension is the percentage of students with at least one out-of-school suspension at any time after ninth grade.

Then, we defined college ready as having taken and passed all of the mathematics, English, science, and social science courses needed to enroll in the state's university system in each grade. Appendix 1 lists the required courses in each grade for eligibility in the University of North Carolina system. Finally, we examined educational attainment. First graduated from high school within 5 years is the percentage who earned a diploma within 5 years of starting ninth grade. Of those who graduated, we examined whether they had enrolled in any public 2-year or 4-year postsecondary educational institution and whether they attained a 2-year degree within 7 years of beginning high school (that is, 3 years after twelfth grade). At the time of these analyses, we have data for that period for all cohorts. As very few students attained a 4-year degree within 3 years, these analyses examined attainment of a 2-year degree but not a 4-year degree.

Results tables show differences in baseline and outcome measures for students who got off target for college in early colleges and traditional schools by failing to advance in key ninth grade mathematics or English courses. We tested differences between off-target early college and traditional students, reporting both the p-value and the effect size, which we used Hedges *g* to calculate. To put

these numbers in context, we included baseline and outcome measures for those who were on target for college in ninth grade. Within the treatment and comparison groups, we did not test differences between groups of on-target/off-target students.

Results

Students became off target for college by failing to advance in key English and/or mathematics classes in ninth grade. The first research question asks whether early college high schools were more effective than traditional schools in preventing students from failing to advance in key ninth grade courses and becoming off target for college. Table 2 presents the weighted percentages of ninth grade students who are on target and off target in early college and a matched sample of traditional high school students. Some early college students did get off target for college in ninth grade, but in early colleges, the percentage of students getting off target was less than half of that traditional high schools (5% compared with 13%, a highly statistically significant difference).

Table 2 The percentage of on-target and off-target students in grade 9 in early colleges and traditional schools

	Early college (N = 18,554) (%)	Traditional (N = 673,329) (%)
On target for college	95	87
Off target for college	5	13***

Findings are presented as propensity-score weighted, regression adjusted means

***p value < 0.001

Table 3 presents characteristics of on-target and off-target students in each school type. It reports differences between on-target and off-target students and calculates the effect sizes and tests statistical significance of differences between the off-target early college and traditional students. In early colleges and traditional high schools, higher percentages of off-target students were Black and male than in the group of on-target students. Consistent with other studies of students struggling academically in ninth grade (National Center for Education Statistics, 2014), this descriptive analysis comparing on-target with off-target students found that off-target students tended to be more disadvantaged economically than on-target students. Over two-thirds of off-target students were eligible for free or reduced-price lunch, compared with about 40% of on-target students. Similarly, more off-target students seemed unprepared for high school. In terms of academic readiness, the off-target students had lower standardized scores on eighth grade reading and mathematics exams than on-target students did. About one third of on-target students passed Algebra in eighth grade, but only 12% of the early college off-target students had, and only 4% of traditional high school students had. That some off-target students had advanced in Algebra in middle school indicates that middle school performance does not fully suffice as an early warning indicator of missing necessary academic targets for college. Educators need to track closely students' progress as they begin high school.

Table 3 Baseline characteristics of early college and traditional high school students, by off-target status:

	On target			Off target			Effect size, p value
	Early College (N = 17,708)	Traditional (N = 529,459)	Difference between on-target groups	Early College (N = 846)	Traditional (N = 143,870)	Difference between off-target groups	
Black	25.2%	23.4%	1.8%	33.5%	39.3%	- 5.8%	- 0.13, 0.0
Hispanic	10.5%	9.8%	0.7%	10.5%	14.0%	- 3.5%	- 0.13, 0.0
Male	39.2%	38.9%	1.0%	46.7%	48.0%	- 1.3%	- 0.03, 0.0
Have disability	4.2%	3.2%	1.0%	11.2%	13.1%	- 1.90%	- 0.06, 0.0
Gifted	21.5%	22.1%	- 2.4%	6.3%	2.4%	3.9%	0.10, 0.0
Economically disadvantaged	50.0%	46.0%	4.0%	68.5%	76.1%	- 7.6%	- 0.15, 0.0
8th grade Math Scale Score (z-score)	0.396	0.506	- 0.11	- 0.508	- 0.631	0.12	0.12, 0.0
8th grade Reading Scale Score (z-score)	0.42	0.51	- 0.09	- 0.219	- 0.368	0.15	0.15, 0.0
Passed Algebra 1 in 8th grade	31.0%	34.5%	- 3.5	11.6%	4.3%	7.3%	0.17, 0.0
Average number of absences 8th grade	5.6	5.7	0.4	12.1	9.8	- 0.17	0.02, 0.004

Findings are presented as propensity-score weighted, regression adjusted means

Table 4 High school engagement and college-readiness outcomes after ninth grade for early college and traditional students, by off-target status

	On target for college			Off target for college			Effect size, p value
	Early college (N = 17,708)	Traditional (N = 529,459)	Difference between on-target groups	Early college (N = 846)	Traditional (N = 143,870)	Difference between off-target groups	
Engagement							
Average absences	5.6	7.6	- 1.9	12.1	16.0	- 3.9	- 0.33, 0.0
Ever suspended	11.4%	19.9%	- 9.50	30.0%	40.4%	- 10.4%	- 0.18, 0.0
College ready—Advancing in required high school courses							
Grade 10	95.1%	90.6%	4.5%	30.0%	13.8%	16.2%	0.333, 0.0
Grade 11	87.8%	85.8%	2.0%	35.8%	20.5%	15.3%	0.317, 0.0
Last grade	78.2%	80.5%	- 2.3%	44.1%	31.8%	12.3%	0.306, 0.0

Findings are presented as propensity-score weighted, regression adjusted means. Last grade of high school is either 12 or 13. All results encompass 5 years

Focusing on differences between the groups of students who got off target for college shows that early college and traditional off-target students were similar in many respects. Although all of the differences were statistically significant, the effect size differences between these characteristics tended to be on the small side. Even though we used propensity score weighting process to balance the observed characteristics of early college and traditional high school students, we found that far fewer early college students got off target in ninth grade. However, in both types of schools, similar students did so.

The second research question pertains to the outcomes of getting off target in early college and traditional high schools. Specifically, for students who got off target in ninth grade, we examined whether early college high schools were more effective in helping them recover than traditional schools were. Table 4 compares school engagement outcomes for on-target and off-target students in both types of schools and tests differences between groups of off-target students. All high school outcomes cover the period from tenth grade through thirteenth grade.

Students who were off target for college in grade 9 were less engaged with school than on-target students were. In both school types, students who were on-target for college had lower suspension and dropout rates than off-target students did. Off-target students had more than twice as many days absent as on-target students did. More than twice as many off-target students subsequently received suspensions as on-target students did.

However, comparisons between students who got off target in ninth grade suggest that those in traditional schools subsequently had more negative outcomes than their peers in early colleges did. Within the groups of off-target students, the suspension rate of traditional school students was about 10 percentage points higher than the early college off-target suspension rate. On average, off-target early college students had about 4 fewer days absent than the off-target traditional students did. Both differences are statistically significant, and the effect size of the difference in absences (0.33) suggests a small effect of early colleges on absences for the off-target students. Based on these findings, it appears that attending an early college protected the off-target students somewhat.

Next, we considered whether students' course taking patterns after ninth grade qualified them to enroll in the UNC system, presenting the percentage of students in each group who advanced in each grade in all core college preparatory class: mathematics, English, science, and social science courses. To be college ready, students needed to take and pass all required courses in each core subject. As one might expect, most of those who were on target for college in ninth grade stayed on target in the later grades. However, as they progressed in high school, and courses became more challenging, the rate of students who met their targets declined slightly each year. At the end of tenth grade, over 90% of on target students in both early college and traditional schools continued to be on target, and by the last grade of high school, 78% of early college and 81% of traditional on-target students continued in that path.

In contrast, for the off-target ninth grade students, the percentage who became on target increased with each subsequent grade. The descriptive results in Table 4 show that, with time, some off-target students were able to recover those missed credits. To be seen as college ready in tenth grade, students had to have advanced in two college preparatory English and mathematics classes and one college preparatory science class. Of early college off-target ninth grade students, 30% were on target by the end of tenth grade. Students had not only made up their missing ninth grade classes, but also advanced appropriately in tenth grade. For the early college students, this pattern continued through high school with 36% on target by the end of eleventh grade, and 44% on target by the end of high school. In the traditional high schools, some off-target ninth graders

subsequently became college ready. By the end of tenth grade 14% of them were, and by the end of high school 32% of them were. Some students who got off target in ninth grade did complete all required courses to be eligible in the university system.

Yet, far fewer of the traditional high school students were able to recover from being off target in ninth grade compared with early college students. In each grade, the difference between having advanced in required high school courses was statistically significant, and the effect sizes were greater than 0.3. At the end of tenth grade, the rate of college readiness for early college students was more than twice that of the traditional schools (30% versus 14%). By the end of high school, although the gap between early college and traditional students narrowed a bit, the college ready rate for early college students was 12 percentage points higher than that of traditional high school students, a substantial difference.

Finally, we examined educational attainment of on-target and off-target students. Table 5 presents educational attainment. More than 90% of on-target ninth grade students graduated high school within 5 years. In contrast, for the off-target students, only about two-thirds did so. That is, a substantial number of students who failed to meet ninth grade academic targets did not complete high school. Of the off-target ninth grade students, early college students had a slightly higher graduation rate than their peers in traditional high schools (66% versus 61%). Although this difference is statistically significant, it has a small effect size (0.1) indicating that it is less practically significant.

For those who completed high school, we examined postsecondary enrollment and attainment of a 2-year college degree. Whether or not they had been off target in ninth grade, the early college students had higher rates of enrollment in 2-year colleges than traditional students did. Among the off-target students, the early college enrollment rate was more than twice that of traditional students (78% versus 34%, a statistically significant difference with an effect size of 0.9, indicating a large influence). This higher enrollment rate is due in part to the fact that early colleges are set on college campuses, with the expectation that students will take college classes in high school. Even students who became off-target in ninth grade still had the expectation and support for taking college classes in high school.

Similarly, with degree attainment, early college students had higher rates of earning a 2-year degree than traditional students did whether or not they were off target in ninth grade. All early college students had the opportunity to work toward a 2-year degree by taking college classes while in high school. Fewer than 10% of off-target students earned a degree within 3 years after twelfth grade, but off-target early college students had a higher rate of degree attainment (7% versus 2%, a statistically significant difference, with an effect size of 0.2). About four times as many off-target early college students attained a 2-year degree. This overall finding is consistent with other analyses of postsecondary outcomes of early college high schools (Edmunds et al., 2020).

In terms of enrolling in a 4-year college within 3 years of twelfth grade, about half of the on-target students did enroll, regardless of whether they attended an early college or traditional high school. Fewer than 10% of the off-target students had enrolled in a 4 year college during this time, but off-target early college students had a higher rate of enrolling in a 4-year college than traditional students did (8 versus 5%, a statistically significant difference, but negligible effect size (0.09). Going to a high school located on a 2-year college campuses does not seem to divert students from pursuing 4-year degrees. One study found that among the early college students who completed an associate degree during high school, 58% had completed a bachelor's degree as well (Zeiser et al., 2021).

Table 5 Educational attainment of early college and traditional high school students, by off-target status, 3 years after twelfth grade

	On target for college			Off target for college			Effect size, p value
	Early college (N = 17,708, 16,415) (%)	Traditional (N = 529,459, 490,808) (%)	Difference between on-target groups (%)	Early college (N = 846, 556) (%)	Traditional (N = 143,870, 87,761) (%)	Difference between off-target groups (%)	
5 year graduation rate	92.7	92.7	- 0.2	65.7	61.0	4.7	0.124, 0.0
Enrolled -2-year college	85.2	46.8	38.4	78.0	33.6	44.4	0.872, 0.0
Earned 2-year degree	35.6	5.3	30.3	7.4	1.8	5.6	0.231, 0.0
Enrolled 4-year college	Enrolled 4-year college	Enrolled 4-year college	Enrolled 4-year college	Enrolled 4-year college	Enrolled 4-year college	Enrolled 4-year college	Enrolled 4-year college

Last grade of high school is 12 or 13. Because data only go through 3 years past twelfth grade, < 1% of the sample had attained a 4-year degree, and those results are omitted. Findings are presented as propensity-score weighted, regression adjusted means. Second N is the sample of high school graduates included in postsecondary outcomes

Conclusion

Implications

In the United States, some students struggle with the transition to high school, and failure in ninth grade can make it more difficult to attend college. However, schools can implement strategies promoted by Dynarski et al. (2008), such as providing academic support and enrichment, implementing programs targeted to student behavior, and personalizing the learning environment. They can also provide authentic instruction that enhances student learning as described by Newmann and Wehlage (1995). These supports can mitigate challenges students face in secondary school and prepare them for postsecondary education.

By design, early college high schools incorporate many of these strategies. The school staff have high expectations that all students will succeed in high school and be prepared for postsecondary work. Along with those expectations, the early colleges provide extensive academic support, such as instilling powerful teaching and learning and fostering strong relationships between teachers and students. This study examined longitudinal data for multiple cohorts of students across the state to address questions about getting off-target in high school.

Research question 1 examined whether early college high schools were more effective at preventing students from missing their targets in ninth grade, and we found that a higher percentage of early college students did meet the target for college readiness, but some students in both school settings failed to advance in key mathematics or English courses required for later enrollment in the University of North Carolina system. As early colleges focus on serving those in groups less likely to attend college, and they require all students to take a college preparatory curriculum, it seemed possible that student could be less prepared for high school and that the demanding curriculum would push more students off target. However, in early colleges only 5% of students got off target in ninth grade, compared with 13% of those in traditional high schools. This difference is highly significant. The more demanding academic requirements did not push students off target for college. By pairing these requirements with active supports, early colleges help students meet these academic challenges. Perhaps in traditional schools, some students could have advanced in these courses and been solidly on target for college at the end of ninth grade if school staff had supported them in doing so.

Consistent with past research (National Center for Education Statistics, 2014) we find that students who got off target for college in ninth grade were disadvantaged compared with on-target students in terms of poverty level and eighth grade academic performance. We did not find differences in baseline characteristics of off-target students in early colleges compared with traditional high schools. Perhaps some students in early colleges who met their ninth grade target would have gotten off target if they had attended a traditional high school.

The eighth grade end-of-grade scale scores were lower for the off-target group than for the on-target group. It is not surprising that students who performed poorly on end-of-grade examinations in eighth grade would struggle to meet academic targets in ninth grade. Strategies such as summer bridge programs (which many early colleges offer) can help students who struggled in middle school prepare for high school. However, as with Allensworth et al. (2014), we found some of these students who had done well in eighth grade became off target for college by the end of ninth grade. In early college high schools, of students who became off target, about 12% had taken Algebra I in eighth grade, and 4% of the off-target students in traditional schools had done so. While this difference is statistically significant, the effect size is small (0.17). Thus, in both early college and traditional schools, eighth grade success does not fully predict ninth grade

success. Educators should monitor all students' academic progress in ninth grade—even students whose eighth grade performance indicated they were prepared for high school.

Our second research question pertained to whether students who got off target in ninth grade stayed off target throughout school. In early colleges and traditional schools, students who got off target for college in ninth grade subsequently had higher suspension rates and absences than those who made the target. Even so, early college off-target students had fewer suspensions and better subsequent attendance than their peers in traditional high schools, suggesting that they remained more engaged in school. The extensive social and academic supports early colleges provide may keep some students from completely disengaging with school.

Additionally, in both school settings, some off-target ninth graders did not ever advance in the key courses required for acceptance to the state's university system. Yet, in every subsequent grade, the rate of being college-ready increased a bit, suggesting that some students just needed more time to succeed. Some students not only made up their ninth grade work, but also took the necessary classes in subsequent grades. Because many early colleges are 5-year programs, those students had another year to make up the ground they lost in ninth grade. However, the college-readiness gap between early college and traditional schools is greatest in tenth grade suggesting that the immediate active supports early college students received helped them become college ready.

Over 90% of the on-target students graduated from high school within 5 years, but only about two-thirds of off-target ninth graders did so—even in the early colleges. Although some students recovered from missing their ninth grade academic target, some did not finish high school, which is consistent with prior research (MacIver & Messel, 2013).

However, some students who had missed ninth grade academic targets ultimately enrolled in a 4-year college. Thirteen percent of off-target early college students did so, and 8% of their peers in traditional schools did. This difference is statistically significant, but the effect size is negligible (0.09) indicating that the relationship between early college membership and enrollment in a 4-year college is not very strong. Although these data do not permit determining whether students attained a degree, their enrollment in a 4-year program suggests that these students may have fully recovered from falling off target.

The relationship between early colleges and postsecondary outcomes for off-target students is far stronger for enrollment in 2-year colleges. Of the high school graduates who had been off target, about one-third of traditional off-target students enrolled in a 2-year college, and more than twice as many early college students did. The effect size (0.87) indicates a substantial effect on this outcome. Because 2-year colleges do not require all of the college preparatory courses that 4-year colleges do, students who did not progress through college preparatory curriculum could still enroll in community college.

Many off-target students who enrolled in 2-year programs did not attain a degree within 3 years of twelfth grade. Perhaps with more time, more of them could attain that degree. However, even without the degree, having those college credits may make it easier to subsequently earn a sub-baccalaureate credential, and/or get a well-paying job. Two-year programs could be a viable pathway for those who miss academic targets in ninth grade. Because early colleges are partners with community colleges, far more of the early college off-target students took community college classes as part of that program and were well aware of the opportunities that 2-year colleges can provide. Students in traditional schools may not have been as familiar with these programs or as prepared to apply.

Far fewer early college students became off target in ninth grade than traditional students did. Supports they received as they transitioned into high school may have helped more of them meet the goal of advancing in college preparatory English and mathematics. Even so, some of them did get off target. Yet, the early college off-target students had greater rates of recovery both in high school and in college, particularly 2-year college. Educational systems should try to foster resilience in students who struggle academically when they start high school.

Limitations

Because the early college students applied to the early colleges, these results may not be generalizable to comparison students who did not apply. Although we used propensity score weighting to select the comparison group and included prior academic achievement in the matching and the outcome models, some unmeasured characteristic of early college applicants, such as personal motivation or parental involvement, may have influenced their ability to recover from getting off target in ninth grade. However, another quasi experimental study of North Carolina's early colleges (Lauen et al., 2017) replicated the findings of a random assignment study of early college high schools (Edmunds, Unlu, et al., 2017).

Given that our data only permitted looking at students in the first few years after high school graduation, we cannot determine the longer-term effects of getting off target in ninth grade. In time, more students may have attained degrees, and those in the comparison group may have been able to catch up with the college enrollment and degree attainment rates of the off-target early college students. Further, we do not have data about employment outcomes for these students, and students who missed the ninth-grade college readiness target may have still been able to obtain a job with a livable wage.

Although we understand the design principles of early colleges and the kinds of services early college students could receive, we do not know the specific services on-target and off-target students utilized, nor do we know the kinds of assistance received in traditional high schools. Further, we do not have information about family or other community factors that contributed to their resilience.

Future Work

This work followed students 3 years after twelfth grade, which was not enough time for students to attain a 4-year degree and may not have been enough time for some students to complete a 2-year degree. By following students over a longer period of time, one could examine these attainment outcomes. Among off-target students, we found differences between early college and traditional students in postsecondary enrollment and attainment. Future research should examine whether these differences persist and whether they are consistent for 4-year degree attainment. Additionally, future work should examine students' subsequent employment status to see whether they recovered in terms of being able to hold good jobs.

Even within the early college, some students do disengage with school, so future work should examine the needs of those who disengage. Past research using site visits and interviews has shown the kinds of supports offered by these early college high schools (Edmunds et al., 2013), but we do not know which of these students got what supports or whether off-target students did not fully utilize these services.

Some students who got off target were resilient. Future research should identify the specific resources that help students who get off target for college recover and determine which supports make the greatest difference. Additionally, future work should examine factors beyond the classroom that influence a student's recovery from getting off-target for college. Family, peers, and extra-curricular activities could all contribute to a student's recovery.

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