**The Small, Stand-alone Early College: Impact on High School Outcomes**

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**Background and Context:** North Carolina's Early College model is the subject of an IES-funded eleven-year longitudinal experimental study that utilized a lottery process to assign early college applicants to either treatment or control groups. This paper presents findings related to high school outcomes.

**Purpose and Goals of Study:** The primary goal of the early college model is to increase the number of students who graduate from high school and who continue on to and succeed in college. The specific research questions addressed in this paper include the following:

1. What is the impact of the early college model on the percentage of students successfully completing a college preparatory course of study in high school?
2. What is the impact of the early college model on the number of college credits earned while in high school?
3. What is the impact of the early college model on students' graduation from high school?
4. How does the impact vary for specific sub-groups including those who are low-income, first in their family to go to college, members of underrepresented minority groups, and those who entered high school below grade level?

**Setting:** The schools in this study are located in districts throughout the state of North Carolina. They include schools located in rural and urban settings from all regions of the state.

**Sample:** The sample analyzed for this paper includes 2,940 students who applied to 19 early colleges and went through a lottery process. Schools enrolled in the study over time so the study includes data from multiple cohorts of students, starting with students who entered high school in the fall of 2005 through students who entered high school in the fall of 2009. Students from 32 different lotteries are included. Table 1 presents an overview of the sample by cohort.

TABLE 1 HERE

We examined baseline characteristics of the treatment and control students to determine if there was statistical balance on observable characteristics between the two groups. Table 2 shows the 8$^{th}$ grade demographic characteristics for the largest sample to be analyzed for this paper. As seen, the treatment and comparison groups are statistically comparable on all but two of the characteristics examined. Only being retained in a prior grade and passing 8$^{th}$ grade Math were statistically significantly different and both measures (along with the other baseline variables) are included as covariates in the impact analyses.

TABLE 2 HERE

**Intervention: Early College High School:** As implemented in North Carolina, early colleges are located on the campus of a higher education partner. The schools develop an aligned curriculum that allows students to attain a high school diploma and two years of college credit in a four or five year time period. Each early college is also expected to implement and exhibit a specific set of principles, known as Design Principles, developed by North Carolina New Schools (the public-private partnership that manages these schools) that represent characteristics of high quality high schools. These Design Principles are as follows: (1) Ensuring that students are ready for college; (2) Instilling powerful teaching and learning in schools; (3) Providing high student/staff personalization;

(4) Redefining professionalism; (5) Leadership and (6) Implementing a purposeful design. Figure 1 presents North Carolina's model.

FIGURE 1 HERE

**Research design:** The results presented in this paper come from a multi-site randomized field trial. From a pool of eligible students who applied to enroll in an early college in a given year, early colleges enrolled students based on lotteries conducted in each year, and the study compares the eligible applicants who were randomly chosen to receive an invitation to enroll (treatment group) with the rest of the eligible applicants (control group, who generally attended the traditional high school in the district or "business as usual"). Each early college and the "business as usual" settings for control group students are considered a "site." As schools continued to add new 9th grade classes via random assignment each year, those students were added to the study sample; hence some sites have multiple cohorts of students.

**Data collection:** The data used in the analyses reported in this paper come from administrative data collected by two primary sources: the North Carolina Department of Public Instruction (NCPDI) and the North Carolina Community College System. The North Carolina Education Research Center at Duke University merged these data with our application data and de-identified the resulting data set for analyses by the research team. The specific outcomes examined include the following:

*Completion of a college preparatory course of study.* Ensuring that students take a college preparatory course of study is one of the approaches recommended to help more students be prepared for college (Tierney, Bailey, Constantine, Finkelstein, & Hurd, 2009). For this study, we developed a measure for assessing the extent to which a student was on-track for college. By the end of their high school experience, they should have taken and passed four English courses, four college preparatory mathematics courses, three science courses and two social studies courses. Thus, we examined the percentage of students who were on-track for college by the time they graduated from high school. The data source for this measure is transcript data collected by NCDPI and passing is indicated by receiving at least a "D" in the class. The sample for this outcome is students who did not have data missing in any year. Students who dropped out remained in the sample. The transcript from the 2014-15 school year is still being processed; therefore, students from cohort 3 are not included in the results presented for this outcome in this proposal but they will be included in the final presentation.

*College credits accrued while in high school.* One of the main theories of change underlying the early college high school model is that early exposure to college courses will make students more likely to succeed in college. While this is implicit to the model, students in comprehensive high schools also have access to college courses through dual enrollment classes or Advanced Placement courses. For purposes of this study, a student was identified as receiving college credit if they took a college course and received at least a "D" in the course or if they took an Advanced Placement exam and received at least a "3" on the exam. We included all college courses—those that were transferrable and those that were vocational in nature—with the exception of remedial or developmental courses that would not contribute to a student's attainment of a postsecondary credential. The data for this outcome come from the North Carolina Community College system,

which provided data on courses taken and grades received for students who were enrolled in a community college while in high school. Data on AP exam performance come from NCDPI. Although many early colleges are five-year programs, to ensure a similar comparison with students in traditional schools, we examine the number of college credits enrolled through the end of 12$^{th}$ grade. The sample for this outcome is the same as the college preparatory course of study sample.

*Graduation from high school.* For this study, we report five-year graduation rates because the majority of early colleges are five-year programs and even those schools that are four years by design allow some students to take five years to graduate. We include only those students who are indicated as having received a regular high school diploma. The graduation data come from the Graduate Data Verification System, which is designed to collect the names, demographic information, course of study and postgraduate intentions of North Carolina high school graduates, and to provide each Local Education Agency (LEA) with an authoritative list of graduates. Only students who have graduated are included in the file. Any student who is not found in this file and who has not been verified as having moved to another school system (either home-schooled, private or out of state) is considered to have not graduated.

*Subgroups.* For this study, we focus on the following four specific subgroups, the first three of which are populations targeted by the initiative:

- *Low-income students.* Students who qualified for free or reduced-price lunch at the time when they applied to the early college (8$^{th}$ grade).
- *First generation college-goers.* Students whose parents did not receive any education past high school.
- *Under-represented minority students.* Students who are members of racial or ethnic groups underrepresented in postsecondary education and include African-American students, Hispanic students, and Native American students.
- *Students entering high school below grade level.* Although not an explicit focus of the initiative, we believed it was important to look at this population because educators were often skeptical that low-performing students could do well in this model. This group is defined as students who entered high school having performed below grade level on the 8$^{th}$ grade exams for English, math, or both.

**Analysis.** The impacts of early colleges on these outcomes are estimated within an Intent-To-Treat (ITT) framework, in which a student's initial experimental status as a treatment or control student, rather than actual participation in an early college, serves as the basis for estimating impacts. Specifically, impact estimates are calculated using multivariate linear regression models that include site indicators (or site/lottery fixed effects), interaction of the treatment indicator with the site indicators, and baseline student characteristics including demographic characteristics such as gender, race/ethnicity, age, free/reduced price lunch status, whether a student was retained prior to 8$^{th}$ grade, and 8$^{th}$ grade academic performance.[1] The coefficients on the site-by-treatment indicators yield site-specific impact estimates, which are then averaged weighting each by the number of students in each site, to yield an average impact estimate that represents the effect on the average student who applied to an early college in our sample. The impact for a subgroup of interest and the rest of the students

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[1] Following Schochet (2008), these regressions do not include random school-effects since the level of analysis and level of random assignment are the same (student) and we will not seek to generalize the results outside our sample.

who are not in that subgroup are calculating by estimating the impact model separately for that subgroup and the rest of the students. We also report whether the effect for a subgroup is statistically significantly different than that for the rest of the sample.

**Results and Discussion:** Table 3 shows the impact estimates for the full sample and the subgroups of interest. Table 3 also shows the number of students contributing to the calculation of each impact estimate. As mentioned above, we are planning to update these results with NCDPI data from the 14-15 school year for the final paper. The results are organized by the specific outcomes.

*Completion of a college preparatory course of study:*  By the end of school, an estimated 77 percent of treatment students had successfully completed a college preparatory course of study compared to 68 percent of control students. The impact of 8 percentage points is statistically significant.

*College credits accrued:* On average, ECHS students earned 19.5 college credits through high school compared to 2.8 credits for the controls students. The impact of 16.7 credits is statistically significant.

*High School Graduation:* The overall impact on five-year graduation rates is 3.1 percentage points, which was statistically significant.

*Subgroup Impacts:* Analyses conducted for the four subgroups show positive and statistically significant impacts for almost all outcomes. When we compare the impact estimates for these targeted populations to the students in the rest of the sample (e.g., impact on first generation students vs. impact on not first generation students), we observe that the impact differences were not statistically significant for the first and third outcomes (completion of college preparatory course of study and high school graduation) and statistically significant on college credits accrued, in the favor of less disadvantaged students.

TABLE 3 HERE

**Conclusions:** Results from this study show that the Early College High School model is having positive impacts on students' college preparatory coursetaking, their attainment of college credits and their graduation from high school.  Sub-group results show that there were overall positive impacts for most groups, although in some cases, it appears that the non-targeted populations are benefitting more from the intervention.

## Appendix A: References

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**Appendix B: Tables and Figures**

**Table 1**: Number of New 9th Grade Study Participants—by Year, Status, and Outcomes

| Year—Cohort Name | Number of Schools | Total Sample | Treatment | Control |
|---|---|---|---|---|
| 2005-2006[a] Pilot 1 | 1 | 77 | 40 | 37 |
| 2006-2007[a] Pilot 2 | 2 | 212 | 91 | 121 |
| 2007-2008 Cohort 1 | 5 | 426 | 283 | 143 |
| 2008-2009 Cohort 2 | 10 | 937 | 423 | 414 |
| 2009-2010 Cohort 3 | 14 | 1,288 | 759 | 529 |
| Total | 32 lotteries for 19 schools | 2,940 | 1,596 | 1,244 |

[a]These years were prior to the official start of the study.
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**Table 2: Background Sample Characteristics**

| | Whole Sample (N=2941) | Treatment Group (N=1698) | Control Group (N=1243) | T-C Difference | | Effect Sizes |
|---|---|---|---|---|---|---|
| | Mean | Mean | Mean | Difference | P-Value | |
| **Race & Ethnicity** | | | | | | |
| Black | 27.6% | 28.4% | 26.6% | 1.8% | 0.16 | 0.06 |
| Hispanic | 7.8% | 8.1% | 7.5% | 0.6% | 0.53 | 0.05 |
| White | 59.4% | 58.7% | 60.2% | -1.5% | 0.22 | -0.04 |
| **Gender** | | | | | | |
| Male | 40.9% | 40.8% | 41.1% | -0.3% | 0.97 | -0.01 |
| **Socioeconomic Background** | | | | | | |
| First Generation College | 40.1% | 39.1% | 41.4% | -2.3% | 0.50 | -0.06 |
| Free/Reduced Price Lunch Eligibility | 48.9% | 49.1% | 48.6% | 0.6% | 0.21 | 0.01 |
| **Exceptionality** | | | | | | |
| Disabled/Impaired | 2.2% | 1.7% | 2.9% | -1.1% | 0.05 | -0.31 |
| Gifted | 8.4% | 7.8% | 9.2% | -1.4% | 0.22 | -0.11 |
| **Retained** | 3.5% | 2.9% | 4.4% | -1.5% | 0.04* | -0.26 |
| **8th Grade Achievement** | | | | | | |
| Math - Z score | 0.00 | -0.01 | 0.01 | -0.03 | 0.43 | -0.03 |
| Reading - Z score | 0.00 | 0.01 | -0.01 | 0.02 | 0.70 | 0.02 |
| Math - pass | 81.8% | 83.4% | 79.6% | 3.8% | 0.01* | 0.15 |
| Reading - pass | 80.4% | 81.2% | 79.3% | 1.9% | 0.16 | 0.07 |

Notes:

[a] The proportions are weighted by students' probability of being selected into the ECHS.

[b] This is the core analytic sample used for many outcomes and excludes students who could not be found in the 9th grade administrative data and students missing demographic data.

**Figure 1: North Carolina's Early College High School Model**

|  | ECHS Design Principles | Intermediate Outcomes | Long Term Outcomes |

**ECHS Design Principles**

**College Ready**
Articulated program of study, grades 9-12 or 13, leading to Associate's degree or 2 yrs college credit, college readiness activities

**Powerful Teaching and Learning**
High-quality, rigorous, and relevant instruction, student collaboration and discussion, formative and multiple assessments

**Personalization**
Academic and affective supports, Supportive relationships

**Leadership**
Common vision, collective responsibility and decisionmaking

**Professionalism**
Ongoing professional development, collaboration among staff

**Purposeful Design**
Autonomous governance, location on college campus, small size, flexible use of time, integration with college

**Intermediate Outcomes**

Increased student attendance

Increased frequency of higher level courses

Improved attitudes toward self and school

Improved behavior

Increased aspirations toward college

Improved student achievement

**Long Term Outcomes**

Increased high school graduation rates

Increased enrollment in college

Improved performance in college courses

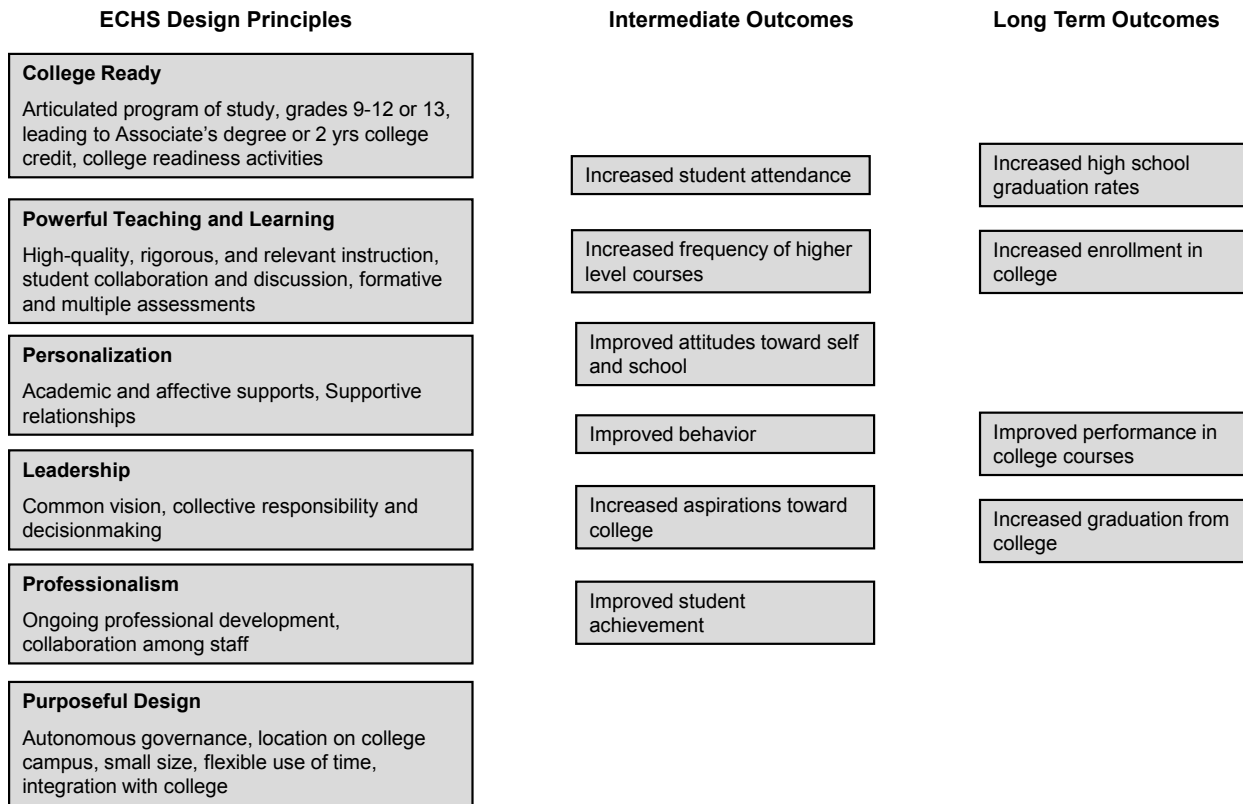Increased graduation from college

**Table 3: Impact Estimates, Overall and by Sub-groups**

| | N | Adjusted Treatment Mean | Unadjusted Control Mean | Impact Estimate | Difference in Subgroup Impacts |
|---|---|---|---|---|---|
| **Panel A: College Preparatory Course Taking (% On Track for College)** | | | | | |
| Overall | 1355 | 76.85% | 67.95% | 8.90%* | |
| Underrepresented | 446 | 76.83 | 68.95 | 7.88 | -2.46 |
| Not Underrepresented | 861 | 80.75 | 70.81 | 9.94* | |
| First Generation | 502 | 72.32 | 58.29 | 14.03* | 5.31 |
| Not First Generation | 814 | 84.75 | 77.36 | 7.39* | |
| FRPL Eligible | 621 | 73.26 | 59.46 | 13.80* | 7.56 |
| FRPL Ineligible | 675 | 84.46 | 77.34 | 7.12* | |
| Not Prepared for 9th Grade | 364 | 58.13 | 47.65 | 10.48* | 2.10 |
| Prepared for 9th Grade | 931 | 85.99 | 77.61 | 8.38* | |
| **Panel B: College Credits Accrued While in High School** | | | | | |
| Overall | 2540 | 19.50 | 2.76 | 17.15* | |
| Underrepresented | 856 | 14.05 | 1.24 | 12.98* | -6.02* |
| Not Underrepresented | 1658 | 21.91 | 3.51 | 19.00* | |
| First Generation | 837 | 16.83 | 1.73 | 15.42* | -2.33* |
| Not First Generation | 1253 | 20.70 | 3.48 | 17.75* | |
| FRPL Eligible | 1181 | 15.88 | 1.66 | 14.51* | -5.17* |
| FRPL Ineligible | 1267 | 22.87 | 3.69 | 19.68* | |
| Not Prepared for 9th Grade | 497 | 10.78 | 0.69 | 10.14* | -9.42* |
| Prepared for 9th Grade | 1740 | 22.50 | 3.53 | 19.56* | |
| **Panel C: Five Year Graduation Rate** | | | | | |
| Overall | 2941 | 83.86% | 80.75% | 3.11%* | |
| Underrepresented | 1049 | 82.56 | 81.55 | 1.01 | -3.60 |
| Not Underrepresented | 1859 | 84.75 | 80.14 | 4.61* | |
| First Generation | 967 | 78.73 | 76.44 | 2.29 | -2.36 |
| Not First Generation | 1417 | 87.4 | 82.75 | 4.65* | |
| FRPL Eligible | 1371 | 79.47 | 77.57 | 1.9 | -3.43 |
| FRPL Ineligible | 1438 | 90.27 | 84.94 | 5.33* | |
| Not Prepared for 9th Grade | 589 | 71.61 | 72.84 | -1.23 | -6.49 |
| Prepared for 9th Grade | 1968 | 89.24 | 83.98 | 5.26* | |

*Statistically significant at $p<.05$.