Abstract Title Page
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Title: Closing the performance gap: The impact of the Early College High School Model on underprepared students

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Abstract Body

Limit 4 pages single-spaced.

Background / Context:

Description of prior research and its intellectual context.

Students entering high school in 9th grade face a formidable challenge. The transition to high school from 8th grade brings with it increased risks for all students. For example, students in 9th grade are anywhere from three to five times more likely to fail a class than students in any other grade (Southern Regional Educational Board, 2002). Similarly, ninth grade retention rates are higher than in any other grade (Smith, 2006). More importantly, research indicates that 70 to 80 percent of students failing in 9th grade will eventually dropout of high school (Wyner, 2007).

Early College High Schools (ECHS) are a new model merging high school and college designed to increase the number of students who graduate from high school and enroll and succeed in college. This paper presents results from a longitudinal, experimental study of ECHS, tracking students from 9th grade through graduation from high school and enrollment in college. Results from earlier analyses have shown a variety of positive statistically significant impacts including:

- ECHS students were more likely to be on-track for college than control students.
- Compared to control students, ECHS students had better attendance, lower suspensions, and were more likely to remain in school.
- ECHS students were more likely to report positive school experiences, including better relationships with staff, higher expectations, more rigorous and relevant instruction, and more frequent and varied support.

Purpose / Objective / Research Question / Focus of Study:

Description of the focus of the research.

This paper will examine impacts of the ECHS model on "underprepared" students, defined as those students who did not pass the 8th grade state exams in either or both reading and math. "Prepared" students, on the other hand, are those passing both exams. In this paper, we report on the impact of the model on the performance gaps between underprepared and prepared students from 9th - 11th grades. This paper addresses the following specific research questions:

1. Are underprepared students more likely to be from traditionally underrepresented groups such as first generation, minority and free/reduced price lunch students?
2. What is the impact of the ECHS model on these students' academic performance?
3. How does that impact compare to the impact on students who are prepared?

Setting:

Description of the research location.

This study focuses on ECHSs as implemented in North Carolina. North Carolina has the largest concentration of ECHSs in the country, with over 70 across the state; all managed by the same entity, the North Carolina New Schools. The 19 schools that are a part of this study are geographically distributed throughout the state; they include schools in rural and urban areas, schools with predominantly white populations and schools with predominantly African-American populations. All of them are autonomous schools managed by the local school district

in partnership with a higher education partner, most frequently a community college. All 19 of the schools in the study are physically located on the campus of their higher education partner.

Population / Participants / Subjects:
Description of the participants in the study: who, how many, key features, or characteristics.

In this paper, we include results from impact analyses completed to date on a longitudinal sample of 1,350 students who started high school in the 2005-2006, 2006-2007, 2007-2008, and 2008-2009 school years and have completed 11th grade. In addition, to address the first research question, we include data from a larger cross-sectional sample of all 9th graders for whom we have complete data (n=2,825). Table 1 presents a summary table of background characteristics for this 9th grade sample. The table shows that the sample is predominantly non-minority and female, with about half of the sample eligible for free or reduced price lunch and close to 40% having first generation college status. In addition, the table shows that the sample is equally distributed in background characteristics across the treatment and control groups, with the sole exception of a small statistically significant difference in free/reduced price lunch eligibility.

-Please insert Table 1 here-

Intervention / Program / Practice:
Description of the intervention, program, or practice, including details of administration and duration.

ECHSs are small, innovative high schools designed to increase the number of students who graduate from high school prepared for enrolling in postsecondary education. Frequently located on college campuses, early colleges serve students in grades 9-12/13. Students are expected to graduate within four to five years with a high school diploma and two years of transferable college credit. The target populations for these schools are students underrepresented in college, including students who are the first in their family to go to college and students who are low-income or members of a minority group underrepresented in college. As implemented in North Carolina, schools are expected to implement a specific set of design principles associated with a high quality school. Figure 1 presents a graphic representation of the conceptual framework of the ECHS model, connecting these design principles with the expected outcomes of the model.

-Please insert Figure 1 here-

Research Design:
Description of the research design.

This paper reports results from an IES-funded longitudinal experimental study of the impact and implementation of North Carolina's ECHS model. Participating schools agreed to use a lottery to select students and the study is tracking outcomes for students randomly accepted into the program and those not accepted who enrolled somewhere else. Schools could enroll in the study at any point; as a result, our sample size increases each year as more schools provide students.

To create the student sample, schools identified an eligible pool of applicants. The research team randomly ordered the list of students from lowest to highest and schools offered students spots in the order in which they appeared on the list. Students on the waitlist who were offered spots in the correct order were included in the treatment group.

Data Collection and Analysis:
Description of the methods for collecting and analyzing data.

We use data collected by the North Carolina Department of Public Instruction and housed at the North Carolina Education Research Data Center, which creates encrypted longitudinal data files by student. The outcomes looked at in this paper include academic course-taking and on-track progress in the subject areas of English, math, science and social studies, as well as overall progress. For this study, we developed an on-track indicator that identified the last possible year in which a student could take a course required for University of North Carolina system entrance without taking two courses in that subject area in the same year. For example, in 9th grade, a student would have to pass at least one English course and one college preparatory math course, In 10th grade, students need to have passed at least two English courses, two math courses, and one science course. In 11th grade, they need to have passed three English courses, three math courses, two sciences and one social studies course. In addition, the study uses demographic data, including gender, race/ethnicity, free and reduced-price lunch status (F/R status), disability status, English Language Learner status, and parents' educational level.

We divided the sample into two sub-groups, according to whether students were identified as underprepared for 9th grade. For each outcome, we calculated unadjusted means for the treatment and control groups within each sub-group. We calculated impact estimates using multivariate linear regression models including site fixed effects, interaction of the treatment indicator with the site indicators, producing site level impact estimates, and baseline student characteristics including gender, race/ethnicity, F/R status age, and whether a student was retained prior to 8th grade. The site-specific impact estimates were then averaged proportionally to the number of students in each site to yield the overall impact estimate for each outcome.

This study was guided by an intent-to-treat (ITT) analysis, which keeps all study participants in the group to which they were originally assigned, regardless of whether participants actually received the entire intervention or not. In this study, any students initially assigned to the early college were included in the treatment group, even if they changed their mind and did not go (no-shows). In addition, students initially identified as being in the control group remained there for analytic purposes, even if they later attended the early college for any reason (crossovers).
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As the ITT approach may understate the ECHS effect on those who ended up participating in the intervention (Hollis & Campbell, 1999). Thus, we also calculated the treatment-on-the-treated or local average treatment effect (LATE), which is calculated by dividing the ITT impact estimates by the factor (1-r-c) where r is the no-show rate and c is the crossover rate (Angrist et al.,1996; Gennetian et al., 2005). In this study, we report the unadjusted means for each group—treatment and control—as well as adjusted impact estimates for both the ITT and LATE analyses.

In addition to looking at the impact of the model on underprepared students, we also wanted to determine whether this impact was different from the impact on students who were prepared. In other words, we sought to understand if the program was increasing or decreasing the gap in performance between underprepared and prepared students. We conducted pair-wise comparisons between the estimated impacts for students who were underprepared vs. those who were prepared and tested whether these differences were statistically significant.

Findings / Results:

Description of the main findings with specific details.

To address the first research question, we conducted a series of analyses comparing the percentage of students prepared for 9th grade by the three primary subgroup indicators: free/reduced price lunch status, first generation college status and underrepresented minority status. We conducted these analyses overall and separately for each treatment group. As Table 1 indicates, in all cases, the percentage of students prepared for 9th grade was statistically significantly lower among students categorized as free/reduced lunch, first generation college and underrepresented minority. For example, only 74% of students in the ECHS group who were on free/reduced price lunch were prepared for 9th grade compared to 87% of students not on free/reduced price lunch. From these results, we see that underprepared students for 9th grade are more likely to be on free/reduced price lunch, first generation college status and a member of an underrepresented minority across both treatment groups and overall.

-Please insert Table 2 here-

In order to address the 2nd and 3rd research questions, we conducted a series of analyses on a cohort of 1,350 9th grade students who had progressed through 11th grade. Table 2 presents the results from these analyses for the core academic subject areas of English, math, science and social studies, as well as overall course-taking and progress. Across most outcomes, the impacts on underprepared students were greater compared to the impacts on prepared students. For example in 10th grade math, the impact on underprepared students progressing in that course was close to 24 percentage points ($p<.05$) compared to an impact among prepared students of 12 percentage points, yielding a differential impact of 11 percentage points ($p<.05$). For science the impact on 11th grade underprepared student course-taking was statistically significantly larger compared to prepared students ($p<.05$). For English and social studies, however, none of the impacts on students as well as their differential impacts was found to be statistically significant. We thus see that the overall effect is driven primarily by math which appears to be a differentiating factor between the HS experience of underprepared and prepared students.

-Please insert Table 3 here-

Conclusions:

Description of conclusions, recommendations, and limitations based on findings.

Results from this experimental study show that it is possible for schools to have an impact on students entering high school at-risk for academic failure and dropout. These data suggest to us that the reduction or elimination of performance gaps in the early college is a product of a purposeful implementation of a high quality learning environment with high expectations, rigorous courses and instruction, positive relationships, extensive student support, and teachers taking responsibility for student learning. We intend to bolster these analyses with additional data on other outcomes such as attendance, suspensions, and aspirations for college. This analysis will represent one of the few studies conducted that combines both a rigorous study design and a focus on those students most at-risk. Most of the previous work that has been presented from this study has focused on students' progression transition from high school to postsecondary study. This paper shifts the focus somewhat to look at the issue of ensuring successful transition from middle school to high school for academically at-risk students within the context of ensuring that all students stay on track for progressing successfully through high school.

Appendices

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Appendix A. References

References are to be in APA version 6 format.

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Gennetian, L. A., Morris, P. A., Bos, J. S., & Bloom, H. S. (2005). Constructing instrumental variables from experimental data to explore how treatments produce effects *Learning more from social experiments: Evolving analytic approaches* (pp. 75-114). New York, NY: Russell Sage Foundation.

Hollis, S., & Campbell, F. (1999). What is meant by intention to treat analyses? Survey of published randomised controlled trials. *British Medical Journal , 319* (7211), pp. 670-674.

Smith, J.S. (2006). Research summary: Transition from Middle School to High School. Retrieved September 2013 from http://www.nmsa.org/Research/ResearchSummaries/TransitionfromMStoHS/tabid/1087/Default.aspx

Southern Regional Educational Board (2002). Opening Doors to the Future: Preparing Low-achieving Middle Grades Students to Succeed in High School.

Wyner J. et al (2007). Achievement Trap: How America is Failing Millions of High-Achieving Students from Lower-Income Families. Jack Kent Cooke Foundation.

Appendix B. Tables and Figures

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Table 1: Background Sample Characteristics

	Whole Sample (N=2825)	Treatment Group (N=1681)	Control Group (N=1144)	T-C Difference	
	Mean	***Mean***	***Mean***	**Difference**	**P-Value**
Race & Ethnicity					
American Indian	0.7%	0.8%	0.6%	0.2%	0.47
Asian	1.1%	1.1%	1.1%	0.0%	0.80
Black	25.6%	26.0%	25.0%	1.0%	0.54
Hispanic	7.9%	8.1%	7.6%	0.5%	0.36
Multi-racial	3.6%	3.5%	3.8%	-0.3%	0.53
White	61.1%	60.6%	61.9%	-1.4%	0.32
Gender					
Male	39.7%	39.8%	39.5%	0.3%	0.55
Exceptionality					
Disabled/Impaired	1.7%	1.6%	1.8%	-0.2%	0.70
Gifted	11.0%	10.2%	12.0%	-1.9%	0.25
First Generation College	39.3%	38.5%	40.5%	-2.0%	0.91
Free/Reduced Price Lunch Eligibility	49.0%	50.0%	47.4%	2.7%	0.01*
Retained	2.5%	2.2%	3.0%	-0.9%	0.12

Figure 1: Logic Model for North Carolina's Early College High Schools

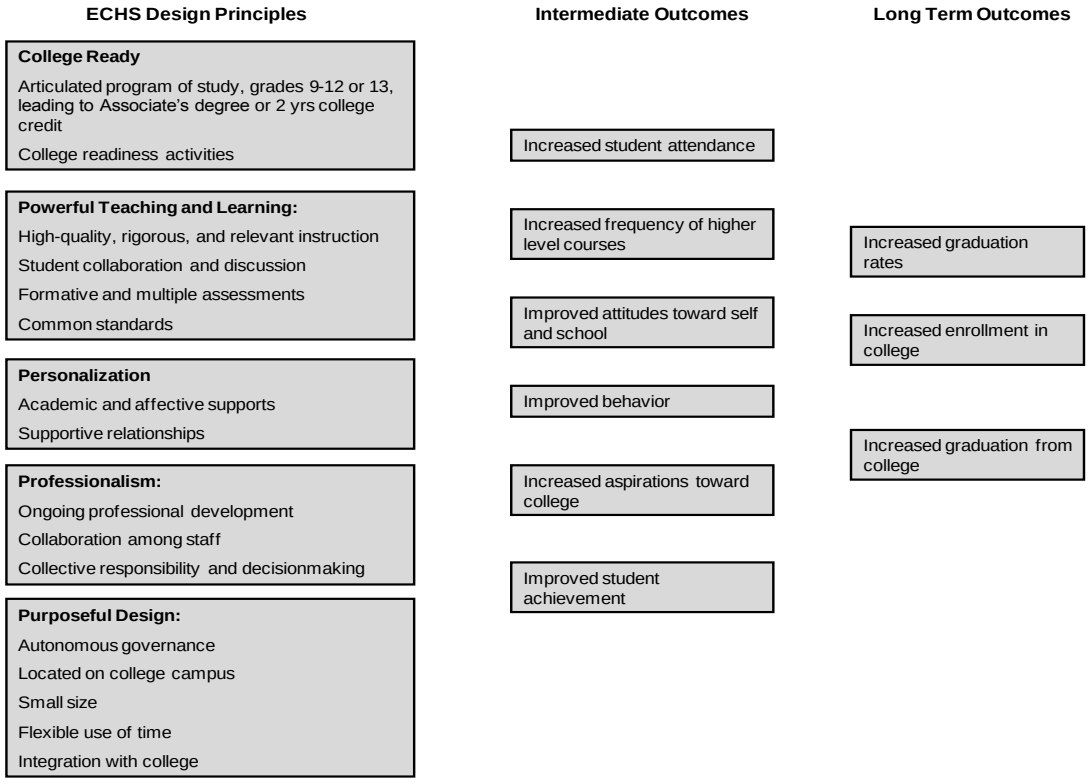

Table 2. Percent Students Prepared for 9th Grade by Demographic Characteristics

Prepared for 9th Grade	Free/reduced Price Lunch			First Generation College			Underrepresented Minority		
	No	**Yes**	**Difference**	**No**	**Yes**	**Difference**	**No**	**Yes**	**Difference**
ECHS (n=1,681)	87%	74%	14%*	84%	75%	9%*	87%	67%	20%*
Control (n=1,144)	86%	64%	22%*	81%	69%	12%*	84%	59%	25%*
Total (n=2,825)	87%	70%	17%*	83%	72%	10%*	86%	64%	22%*

* Denotes statistically significant differences at the p<0.05 level

Table 3. Student Outcomes: Students Who Passed vs. Did Not Pass Both Eighth Grade Reading and Math Who Took or Progressed in Enough Courses to be On-Track for College

Outcomes		Did Not Pass Both Eighth Grade Reading and Math				Passed Both Eighth Grade Reading and Math				Did Not Pass - Passed
		Unadjusted Means		Adjusted Impacts		Unadjusted Means		Adjusted Impacts		
		ECHS (N=231)	Control (N=178)	ITT (A)	LATE	ECHS (N=563)	Control (N=378)	ITT (B)	LATE	Differential Impact (A-B)
Overall										
9th Grade	% Take-Up	88.9	77.0	11.5*	12.5	99.8	93.8	5.2*	5.6	6.3
	% Progress	78.6	66.3	8.6*	9.4	97.9	89.9	7.3*	7.9	1.3
10th Grade	% Take-Up	75.1	52.2	20.6*	22.5	98.2	87.4	10.0*	10.8	10.6*
	% Progress	68.4	43.2	24.0*	26.1	95.4	83.3	12.6*	13.6	11.4
11th Grade	% Take-Up	73.3	50.1	22.0*	23.9	94.8	85.4	10.6*	11.5	11.3*
	% Progress	62.9	44.6	14.7*	16.0	91.3	81.4	10.4*	11.2	4.3
English										
9th Grade	% Take-Up	99.6	97.8	1.8^	2.0	99.8	100.0	-0.2^	-0.2	2.0
	% Progress	92.0	93.8	-3.3	-3.6	98.6	98.4	0.2^	0.2	-3.5
10th Grade	% Take-Up	96.4	93.2	2.4	2.6	99.5	99.1	0.4^	0.4	2.1
	% Progress	90.2	84.2	5.1	5.5	98.2	96.4	2.0	2.1	3.1
11th Grade	% Take-Up	92.9	88.3	3.2	3.5	98.0	96.9	1.8	1.9	1.5
	% Progress	86.2	83.8	-0.6	-0.6	95.5	93.8	1.6	1.7	-2.2
Math										
9th Grade	% Take-Up	88.9	77.0	11.5*	12.5	100.0	93.8	5.3*	5.8	6.1
	% Progress	83.5	67.4	12.9*	14.1	98.4	89.9	7.8*	8.4	5.1
10th Grade	% Take-Up	75.1	52.2	20.6*	22.5	98.2	87.4	10.0*	10.8	10.6*
	% Progress	69.7	44.3	23.5*	25.6	95.9	84.1	12.1*	13.0	11.5*
11th Grade	% Take-Up	75.1	51.3	22.8*	24.9	95.8	86.0	10.9*	11.7	12.0*
	% Progress	66.5	46.8	16.7*	18.1	93.2	82.7	10.8*	11.6	5.9
Science										
10th Grade	% Take-Up	99.6	97.2	2.4^	2.6	100.0	99.7	0.3^	0.3	2.1
	% Progress	97.8	93.2	3.9	4.2	99.3	99.0	0.3^	0.3	3.6
11th Grade	% Take-Up	98.2	92.7	4.3*	4.7	99.7	99.5	0.1^	0.2	4.2*
	% Progress	93.8	88.2	4.5	4.9	99.1	98.6	0.6^	0.6	3.9
Social Studies										
11th Grade	% Take-Up	99.6	98.3	1.2^	1.4	99.8	100.0	-0.2^	-0.2	1.4
	% Progress	97.3	96.1	1.0	1.1	99.5	99.3	0.2^	0.2	0.8

* Denotes statistically significant differences at the p<0.05 level.

^ Because the means for these outcomes are close to 100%, the ITT estimate is set to be equal to the unadjusted mean, and the p-value is calculated using Fisher's exact test.