Abstract Title Page

Title: Improving Postsecondary Outcomes for Low-Income and Minority Students: The Challenges of Taking an Intervention to Scale

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Abstract Body

Background / Context:
Despite years of programs designed to increase the participation of underrepresented minorities in science, technology, engineering, and mathematics (STEM), the number of minorities entering such occupations continues to lag behind those of whites (with the exception of Asians; NAS, 2011). Within certain fields, such as the social sciences, the numbers of underrepresented groups has increased significantly. In other areas, however, such as within the biomedical and behavioral sciences, population disparities continue to persist (NRC, 2000). This is particularly troublesome, given the increasing numbers of underrepresented groups in the U.S. population (NAS, 2007). Projections suggest that the proportion of underrepresented minorities in science and engineering would need to triple to match their numbers in the U.S. population (NAS, 2011). Solutions for addressing these problems are complex, yet researchers agree that STEM experiences need to be infused throughout the educational spectrum from kindergarten through postsecondary school (NAS, 2011). This study focuses on one key ladder in the educational pipeline, the high school. The College Ambition Program (CAP) is an intervention with a staggered rollout, beginning with two high schools in 2010 and gradually scaling up to fourteen high schools for the 2013-2014 school year. This research examines the scale-up of CAP, focusing on how the intervention has increased postsecondary enrollment and interest in STEM while considering the replication of treatment and fidelity of implementation across sites and over the years.

Purpose / Objective / Research Question / Focus of Study:
The experiences of students in high school often determine the trajectories of their academic preparation, educational expectations, and career knowledge. Without access to role models, awareness of college programs, and specific academic guidance, high school students, especially those in underrepresented groups, are unlikely to be adequately prepared for college and have the requisite information for choosing a STEM career. More than 90 percent of entering U.S. ninth grade students expect to attend college, however, an estimated 25 to 30 percent of high school seniors fail to enroll in a postsecondary institution. Between 1972 and 2008, the immediate college enrollment rates of high school completers from low-income families trailed the rates of those from high-income families by at least 20 percent (Aud et al., 2010, p. 70). This mismatch between college ambitions/aspirations and college enrollment raises several questions regarding low-SES and minority students’ access to and preparation for college:

1) Which strategies can make a difference in college-going rates of low-SES and minority students?

2) How can secondary institutions (particularly those in low-income communities) better support low-SES minority students on their path to enrolling and persisting in postsecondary institutions, especially within the STEM fields?

Hypotheses: Results from CAP interventions beginning in 2010 suggest that as the program is scaled to more schools the numbers of seniors attending postsecondary education should increase by about ten percent from baseline rates (Schneider, Khawand & Judy, 2012). We expect this percent to increase over each successive year of CAP, with younger cohorts showing greater
increases in postsecondary attendance rates having increased exposure and dosage to CAP. We expect to gain insights in the effects of CAP’s four programmatic components on postsecondary matriculation, showing relationships between components on visualization, realistic actions, and strategic plans (see below for more detail).

**Setting:**
CAP is a whole-school, quasi-experimental design that currently operates in fourteen public secondary schools (ten urban and four rural) in Central and Southeastern Michigan. In addition to the intervention schools, there are 42 matched comparison sites, determined by using propensity-score matching techniques to match each treatment school with three comparisons on a series of key covariates including postsecondary enrollment rates, school size, Census designation, poverty rate, and racial/ethnic diversity using school-level state data.

**Population / Participants / Subjects:**
The urban schools serve a racially diverse population of students (see Table 1). The rural schools serve a predominately white student population. The sizes of the schools vary from around 700 to 1,200 students for the urban sites and between 300 and 600 students at the rural schools. The urban schools serve a large percentage of economically disadvantaged students, with 70 percent of their students eligible for free and reduced lunch. At the rural schools, around 30 percent of the students are eligible for free and reduced lunch. All treatment schools have a substantial number of students who would be the first in their family to go to college.

**Intervention / Program / Practice:**
CAP operates through a Center in each treatment school and is available to any student. The CAP model supports integration into existing structures within each school and coordinates with school counseling staff and teachers to increase awareness of CAP resources. The CAP center is open during and after school to ensure that CAP resources are accessible to students without disrupting class attendance. Each CAP Center is staffed by a site coordinator and this person facilitates support around four components: (1) tutoring and mentoring; (2) course-counseling and advising; (3) financial aid; and (4) college visits. Each site coordinator plans school-wide activities like financial aid nights and ACT preparation sessions, makes presentations in classes, attends school functions, works to become part of the school culture, and oversee volunteer undergraduates majoring in science and mathematics who serve as near-age peer mentors and tutors.

In addition to the four central components of the CAP model, as the intervention has been brought to scale, continuous improvements have been made to refine the model to increase effectiveness and to understand the replication and scale-up process. Because the intervention is designed to be available to an entire school population, there are likely student selection biases that could comprise the program’s measured effect. To understand these selection effects, a within-study experiment in which students are randomly induced through text-messages and emails to take up the CAP services is also conducted and provides data for estimating unbiased student-level effects by generating random variation in student participation in CAP.
Research Design:
Since the beginning of the intervention, participating schools are identified using state administrative data, census data, and data from the Common Core of Data (CCD). The procedure we followed was first to identify potential schools in the Central-Michigan area that met the treatment criteria and then to follow-up with school and district personal on the feasibility of establishing a partnership. For the 2013-2014 school year, we were encouraged to expand our intervention into Southeast Michigan by the Office of Educational Improvement and Innovation at the Michigan Department of Education, which was looking to support new college going interventions in Detroit-area schools. Among the schools that met the criteria and were willing to participate, we assigned treatment status. We also identified representative schools that were most like those in their group.

To create a matched comparison sample of schools, we use methods developed for strategic sample selection as detailed in: Stuart, Cole, Bradshaw, & Leaf (2011) and Tipton (2011). Once treatment schools were identified, a matched set of control schools was created with three control schools for each treatment schools. The matched comparison schools allow us to look more closely at differences in how high schools introduce and encourage students to pursue STEM careers. This approach also acknowledges the variation across school settings and allows for statistical control of these covariates in lieu of randomization of treatments across schools. In addition to analyzing data from the comparison schools, we also are undertaking a variety of analyses with state and national datasets to compare results of this intervention with other high school programs.

Data Collection and Analysis:
There are four primary sources of data are: (1) a CAP student survey given to all students in treatment schools, (2) tutor/mentor contact logs completed during the course of the intervention to measure treatment dosage, (3) a senior exit survey given to all 12th grade students just prior to graduation, and (4) postsecondary enrollment data that will come from the National Student Clearinghouse (NSC). Additional data from school administrative records will also be used. For the control schools, data is obtained through restricted access to student-level state data.

To estimate the effects of the intervention on college enrollment and interest in STEM, we plan to estimate an Intent-to-Treat (ITT) model, where the primary outcome of interest is whether or not the student enrolled in college in the fall and if a student declared a STEM major. These comparisons can be made within treatment schools as part of the within-study randomized experiment and to similar students in the matched comparison schools where there is no CAP intervention. Additional models that will be estimated include logistic analyses with a binary outcome for whether or not the student fulfilled their original plans based on their exit survey and also a categorical outcome for the type of postsecondary institution in which they enrolled. Each of these models will include student-level covariates, school-level fixed effects, and the primary explanatory variable—assignment to treatment.

Findings / Results:
More robust findings from the 2012-2013 cohort of seven schools will be available by the time of the conference in March. NSC is currently collecting postsecondary enrollment data on this cohort, and we are also still waiting for administrative data from our district partners that include
To help gauge the statistical considerations of taking the CAP intervention to scale, we performed a power analysis using *Optimal Design Plus* software (Spybrook et al. 2011). Figures 1 and 2 represent statistical power projections as the CAP intervention moves to scale. Figure 1 illustrates that 80% power is reached when the total sample size of schools reaches 30. For 2012-2013, we had a total of 28 schools in the study, putting us close to the 80% benchmark. For 2013-2014 however, with a total of 56 schools in the study sample, our power to detect a possible treatment effect well exceeds 90%. Figure 2 presents a second power analysis with more conservative estimation of treatment effects. In this scenario, 80% power is reached with about 50 schools in the sample, suggesting that this year’s cohort of 56 schools will be sufficiently powered to even detect a more conservative treatment effect.

**Conclusions:**
As the demand for a college-educated population increases, so have the numbers of college-going interventions, many of which include components such as training for counselors to improve their college counseling expertise; offering schools tutoring and mentoring staff; providing information and assisting students with filling out financial aid forms; and taking students on college visits. While helpful, these interventions typically focus on one aspect of the college-going process, and few deliver training for accessing and using the information that many parents and students need to understand the material they receive. In contrast to these one-dimensional reforms, CAP is specifically designed to be an intervention that connects several important aspects of the college-going process. Further, given the national urgency around boosting college enrollment and STEM career development, policymakers need a better understanding of what college interventions look like when taken to scale, since any solution to these issues must be resilient to multiple contexts and settings.
Appendices

Appendix A. References


Appendix B. Tables and Figures

Table 1. Number of Schools and Students in the Treatment and Matched Control Schools, SY 2010-2011 to SY 2014-2015

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<td><strong>5,783(^c)</strong></td>
<td><strong>10,902(^d)</strong></td>
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\(^a\) Projected number of CAP treatment schools  
\(^b\) Projected number of control schools  
\(^c\) Actual fall student enrollment for CAP treatment and control schools  
\(^d\) Approximate number of students in projected treatment & control schools  
\(^e\) Numbers of control schools and students are not available 2014-2015 as we will draw these numbers from national longitudinal studies and state administrative data.

Note: In the 2014-2015 school year, we will continue to offer CAP services to our 16 treatment schools. The 16 control schools from 2013-14 school year will not be added to the treatment schools in 2014-15.
Figure 1. Power Estimates for CAP Intervention vs. Total Number of Schools (Less Conservative Estimate)

Note: Estimates calculated using Optimal Design Plus Version 3.0 (Spybrook et al. 2011).
Figure 2. Power Estimates for CAP Intervention vs. Total Number of Schools (More Conservative Estimate)
Note: Estimates calculated using Optimal Design Plus Version 3.0 (Spybrook et al. 2011).