THE NATIONAL CENTER ON SCALING UP EFFECTIVE SCHOOLS

Improving Postsecondary Outcomes for Low Income Students: *Scaling-Up the College Ambition Program*

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The National Center on Scaling Up Effective Schools (NCSU) is a national research and development center that focuses on identifying the combination of essential components and the programs, practices, processes and policies that make some high schools in large urban districts particularly effective with low income students, minority students, and English language learners. The Center's goal is to develop, implement, and test new processes that other districts will be able to use to scale up effective practices within the context of their own goals and unique circumstances. Led by Vanderbilt University's Peabody College, our partners include The University of North Carolina at Chapel Hill, Florida State University, the University of Wisconsin-Madison, Georgia State University, and the Education Development Center.

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Improving Postsecondary Outcomes for Low Income Students: Scaling-Up the College Ambition Program

Abstract

Although the majority of high school students in low-income communities desire to attend college, only about 30 percent who state this desire actually matriculate. The College Ambition Program (CAP) is a quasi-experimental study designed to help support high school students in developing and pursuing postsecondary ambitions, with a special emphasis on educational and occupational pathways in science, technology, engineering and mathematics (STEM). Analysis of data from the first two years of implementation find no significant differences in postsecondary ambitions between the treatment and control schools and a positive effect for interest in pursing a STEM degree for students in the treatment schools. A discussion of the results and multiple methodological approaches to measuring effect sizes under limitations of a small-sample, quasi-experimental research designs are proposed.

Background

The overwhelming majority of ninth graders expect to attend college, yet the rate at which U.S. public high school seniors successfully matriculate to postsecondary institutions is problematically low, especially among students with limited economic and social resources. Many adolescents also have interests in science careers but their knowledge of these occupations is often based on popular media. The challenge for high school students from low-income families is redirecting their interests toward realistic science, technology, engineering, and mathematics (STEM) careers, learning what scientists in particular fields actually do, and what types of education and experiences both in- and out-of-school are required to pursue such occupations (Schneider, 2007). Designed for high schools with lower-than-average college matriculation rates, the College Ambition Program (CAP) focuses on: tutoring and mentoring; course counseling and advising; financial aid planning and assistance; and college visits.

The first three years of the CAP study began in 2009-2010 with the development of instruments and piloting of data collection procedures; establishment of programmatic components and tutoring mentorship partnerships; and the collection of baseline data (spring) in treatment and matched comparison high schools. Full implementation began in 2010-2011 with four public Michigan high schools with one urban and one rural treatment school and two matched comparison schools. The two control schools were subsequently phased into the treatment group in 2011-2012. This process was part of an agreement reached with the high schools for participating as controls in the prior school year. For the 2011-2012 school year, there were four treatment schools—two urban and two rural—with four new matched comparison schools.

The CAP model is built on the premise that high schools are dynamic and that school populations also can change over time. Trying to build models whereby inferences can be drawn to all students in all schools is often imprecise. Rather to achieve greater precision of generalizability to specific populations, researchers are cautioned to use a variety of matching techniques. This paper will: (1) present preliminary results from the first two years of the CAP intervention, examining the outcomes of postsecondary ambitions and interest in STEM; (2) discuss strategies used to evaluate the effectiveness of the CAP model given a small sample of schools; and (3) demonstrate how these estimates can support the scale-up of CAP and contribute to the empirical research on the policies, practices, and processes related to improving postsecondary opportunities for students, particularly for low-income, racial minority, and first-generation college student populations.

Conceptual Framework and Hypotheses

Despite years of programs designed to increase the participation of underrepresented minorities in STEM, the number of minorities entering such occupations continues to lag behind those of whites (with the exception of Asian students; 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 project focuses on one key ladder in the educational pipeline, the high school.

The experiences of students in high school often determine the trajectories of their academic preparation, educational expectations, and career knowledge—all of which are critical for achieving postsecondary success. 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. A recent NCES report finds that 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). This mismatch between college ambitions/aspirations and college enrollment raises several questions regarding low-SES and minority students' access to and preparation for college: What strategies can make a difference in college-going rates of low-SES and minority students? 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?

As the demand for a college-educated population increases, a number of intervention programs have been created to address the misalignment between low-SES students' ambitions and college enrollment. These initiatives include: developing new programs placing recent college graduates into high schools to provide counseling (e.g. National College Advising Corps); providing schools with tutoring and mentors (e.g. GearUp and 21st Century Learners); supplying information and assisting students with filling out application/financial aid forms (e.g. Expanding College Opportunities). While helpful, these and other interventions (some of which are being evaluated with rigorous random trials) target just one aspect of the college-going process, and they do not specifically focus on STEM. The numbers of quasi-experimental studies that concentrate on enhancing student interests and matriculation into STEM fields in college is relatively limited.

The CAP intervention specifically targets educational and careers opportunities in STEM because of the growing demand for employment in these sectors and the occupational outlook for these careers. Individuals in the STEM sectors earned 70 percent more than the national average in 2005 and also benefit from higher starting salaries compared to jobs outside of the STEM discipline (Terrell, 2007). More specifically, the science and engineering workforce is growing faster than any other sector, with more than 5 million workers and strong projections for future employment growth (NRC, 2011). Although the CAP model supports a diversity of student career ambitions, each of the intervention components includes an element that specifically addresses the support of STEM educational and careers aspirations.

We argue that to make a meaningful difference in interest and persistence in STEM requires a comprehensive approach that is research-driven. While many middle-class students rely on family, teachers, and counselors for assistance in making academic, educational, and career decisions, students with limited family resources, including those in households where parents did not attend college, often attend high schools with inadequate guidance resources (McDonough, 1997; McClafferty, McDonough, & Nunez, 2002). These students often lack access to role models

and experiences that can help promote the transition to postsecondary education (Rosenbaum, 2001). This lack of exposure to different types of careers in families, schools, and communities can be a serious barrier to visualizing a career and articulating the steps and choices necessary to achieve a desired occupation (National Center for Education Statistics, 2011; Robinson & Harris, 2012).

The model for this intervention is designed to fill this information void based on multiple studies including one that followed over 1,000 adolescents from middle school into adulthood (Schneider & Stevenson, 1999, Csikszentmihalyi & Schneider, 2000; Schneider, 2007), a four-year random clinical trial (Arora, Schneider, Thal, & Meltzer, 2011), and reviews of the extant literature on determinants of college enrollment (see Roderick, Coca, & Nagaoka, 2011; McDonough, 1997). Based on evidence from these studies it appears that adolescents' selection of a postsecondary institution and college major in STEM and other fields is associated with being able to visualize oneself as a college student, transform interests into realistic actions, and create strategic plans. Although there is an optimal level of postsecondary education for each student, we can expect students to mismatch in their postsecondary choices due to several factors that fit into this conceptual framework including: imperfect foresight, gaps in ability and motivation, misalignment between ambitions and forming concrete plans, inherited education values and perceptions, misconceptions about the college and financial aid process. These concepts of visualization, realization, and strategic planning constitute CAP's integrated program of academic, social, and financial resources, designed to improve adolescents' understanding of the educational requirements for a given career path, and to develop the knowledge, attitudes, and behaviors for attaining their goals (see Schneider, 2007).

Results from current trials suggest that as CAP is scaled to more schools the numbers of seniors attending postsecondary education should increase by 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. Methodologically, we expect to produce robust generalizable inferences by using propensity score matching techniques at the school level, thus reducing the number of treatment and control schools needed between efficacy and effectiveness trials.

Nature of the Intervention

CAP has four major components each of which primarily operates through a "CAP Center" that is open three days a week for six hours, including after-school hours. This schedule is designed to be accessible to students while not disrupting class attendance during the day. The CAP Center is intended to be an integral part of the school, rather than just a supplemental service. Announcements and signs are posted throughout the building, and CAP staff members are encouraged to make presentations in classes and attend school functions. Students are encouraged by their teachers and counselors to attend the Center for tutoring help and college preparation. A full-time CAP site-coordinator organizes the mentors and other activities sponsored by CAP, including school-wide events and college visits.

Tutoring and Mentoring

Research shows that the most successful high school students receive help from parents, tutors, and special services, such as independent college consultants (McDonough, 1997). For low-income students, accessing such assistance can be problematic both in terms of social and economic resources (Crosnoe, 2009). CAP offers tutorial help using undergraduate honors students (with a particular emphasis on recruiting STEM majors) for subjects in which students often have demonstrated difficulty—algebra, statistics, biology, chemistry, physics, and English—all of which are important for college admissions and entrance exams. Low-income and minority students, many of whom are the first in their families to attend college or aspire to a professional career, may have few contacts through family or friends to professional career role models. Several steps have been taken to ensure that CAP's tutoring and mentoring services provide students with high quality academic assistance, including high quality tutors, expertly trained, and systematically evaluated.

Course Counseling and Advising

Low-income and minority students and their parents disproportionately lack access to information about the courses needed for acceptance by all types of colleges and the preparation required for specific careers (Robinson & Harris, 2012; Perna et al., 2008). Research shows that these students are less informed on how to navigate through an educational system in which their choices can have consequences that are difficult to reverse (Riegle-Crumb, 2006). Not taking advanced math and science courses in high school, such as physics and calculus, or not earning good grades in these subjects makes it more difficult to be admitted to a four-year college and eventually graduate with a baccalaureate degree (Riegle-Crumb, 2006; Schneider, Swanson, & Riegle-Crumb, 1997). CAP has developed an extensive set of activities, beginning when students first enter high school that helps them make more informed choices about courses and the steps for applying to different types of colleges and opportunities for majoring in STEM.

CAP site coordinators partner with the treatment high schools' counseling staff to advise students on selecting courses that align with particular careers of interest and curriculum requirements for their individual needs. One difficulty for students is that the scheduling window is open only for a short period of time (one to two weeks during spring semester) with elective priority going to students in upper grades. During this short two-week window many students have to make choices between personal interest electives (e.g., band, choir, advanced physical education, art, and life skills) and academically rigorous electives such as zoology, anatomy/physiology, pre-calculus, AP courses, and foreign languages. CAP coordinators take student interests and goals into account before advising on course selection. Students' thoughts on prospective colleges, intended college majors (STEM vs. non-STEM), and career goals are necessary pieces of information required for advising a student toward one class over another. CAP site coordinators use graduation requirement worksheets (provided by high school counselors), student transcripts, information on students' academic track (e.g. advanced, at grade level, below grade level), and individual college course requirements to provide students with information to make an informed decision about what electives to select. CAP's curriculum and approach to course counseling is guided by *Ten*

***Steps to College*[1], which was created specifically for CAP. The site coordinators refer to the *Ten Steps to College* when discussing college goals and pathways with students.**

Financial Aid

The costs of college have risen exponentially over the last decade and in this economy, few low-income families have the resources (even with federal assistance) to afford sending their children to postsecondary school (Perna, 2008). To address these challenges CAP has developed a series of materials that go beyond just assisting students through the Free Application for Federal Student Aid (FAFSA) process. CAP supports students in searching for scholarships and additional grants, understanding how much money students are still responsible for after receiving scholarships and/or financial aid, and what actionable steps students and their families need to complete between the time of college acceptance to matriculation in the fall. Even when low-income students receive acceptance into college and financial aid, some still fail to matriculate in the fall. CAP intensively works with graduating seniors in May to identify how much money the family and student actually need to begin college in the fall, what forms must be completed, how to plan for living arrangements, how to register for classes, and how to seek employment (especially work-study opportunities). CAP also works with the MSU College of Law to help parents who may have difficulty accessing financial support for their children because of legal and immigration issues.

College Visits

Research shows that college visits are one way that adolescents can form concrete visualizations of going to college. Participating in college visits has been shown to have a significant association with college-going (Hill, 2008). CAP provides students with the opportunity to visit college campuses. CAP has also designed a special training program for students visiting campuses to assist them in evaluating how the college fits their expectations. Additionally, CAP has developed a set of measures for students to evaluate the usefulness of the college visits. Research on the effects of college visits is particularly limited; for example, the Hill study (2008) was based on a national representative longitudinal study of high school students in the early 1990s.

CAP provides an opportunity to look more closely at this process. CAP college visits involve participating in official campus tours of one to three colleges in a single day. These CAP-organized college visits are open to all students interested, with priority going to 10th and 11th grade students. CAP provides students with five different opportunities for students in intervention schools to participate in college visits throughout the school year. In an effort to build the college-going culture within CAP schools, one of the goals of the college visits is to give students an authentic, direct experience of the college environment. In contrast to various other programs or interventions

[1] The *Ten Steps to College* include: Organizing and Preparing for the College Process; Selecting your Courses; Paying for College; Getting Involved: Building your Extracurricular Resume; Standardized Testing; Researching Colleges; College Visits & Interviews; Crafting your College Essay; Creating your College Application; and Final Steps: Tips on Making the Final Choice. These ten modules address general college preparedness and provide information regarding milestones in the college application and selection process. Each module is freestanding, written in accessible language, and designed to demystify the college application process. Accompanying the modules is a set of videos which can be found on the CAP website (www.collegeambition.org).

that might offer college visits, CAP provides this opportunity at no cost to the students. Students are prepared in advance, learning what to look for and what questions to ask while on the tours.

Considerations for Scaling-Up the Intervention

CAP is a whole school design that provides resources and support to all students, not only those who identify with a particular career or perform well in specific courses thus attempting to avoid common problems of other STEM intervention programs that target specific grade levels or groups of students. In these instances, it is difficult to ensure that the students in the program are not affected by other non-participants. In schools where few students attend college (the target population in this study), implementing a program for a small group can create resentment among those not selected. These non-selected students may perform at lower levels than expected. In another situation, these non-selected students may respond competitively and perform better than they might have otherwise. Or they may pressure those in the program to drop–out or participate with minimal levels of involvement. Estimates of treatment effects could be biased upward in the first instance and downward in the second. Evidence suggests that these types of responses occur in high schools, especially when programs divide the school community into groups: those going to college and those unlikely to go (Carter, 2006).

With the current economic conditions and declining funding for schools in the state, all of our partner districts and schools have been highly cooperative and encouraging of the intervention, which is a strength of the CAP intervention and a propellant to scaling-up. Currently, there are schools that are on a waiting list to participate in the intervention. Even though there is a high level of willingness to participate in CAP, the intervention still includes specific tenets for staff cooperation, partnering with the staff of each school as to become part of the school culture, not a supplant of any staff members or to replace any support systems that already exist in the school. Issues of divisiveness can also apply to the staff. If a program focuses on one group of school professionals and not others, it is difficult to coordinate messages and activities. Confusing and conflicting messages given by the school staff can undermine a program’s intent and reinforce impressions of likely and unlikely potential college applicants. By offering a whole-school intervention, this program is designed to avoid problems of “atypical responses” that could occur.

There is also the issue of detecting significant effects for programs with limited time frames. Baker (2007) argues that research-based innovations need an extended period of time to develop in order to “meet feasibility requirements and to gain credibility conferred by a strong base of evidence” (p. 37). This point of sustained innovation is also made by Bryk, Gomez, and Grunow (2011). When a new program begins in a school, sometimes the excitement of the program can encourage positive results, or the beginning may be fraught with organizational problems that undermine programmatic objectives. In either case, the more desirable path is to have a sustained program over time. We also are aware of program effects that could occur because of time varying conditions such as students who transfer in and out of the school during their high school careers.

Sample

The staggered rollout of the intervention, from two treatment schools to a full scaled-up trial, has influenced our consideration of schools to participate as a treatment school. Table 1a

shows the scale-up strategy from our first year in 2010 until the 2013-2014 school year. Initially, to select the participating schools we used state administrative data, census data, and data from the Common Core of Data (CCD). A group of schools was identified that had approximately 30 percent or more of its student population eligible for free or reduced lunch, low college-going rates in the community (only 15 percent of the adults in the community held bachelor's degrees or higher), and lower-than-expected college-going rates among high school students (less than 60 percent of the high school seniors entered postsecondary institutions in the fall following their high school graduation). Table 1b shows the demographic characteristics of the treatment and control schools for 2010-2012. The procedure we followed was first to identify potential schools in the greater mid-Michigan area that met the treatment criteria and then to follow-up with school and district personal on the feasibility of establishing a partnership. We chose the greater mid-Michigan area because of its proximity to our research institution, primarily to reduce transportation costs for staff and mentors and to allow for an opportunity to provide adequate service and systematically keep track of how the program was being implemented. 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.

In selecting future schools for the 2012-2013 school year, we applied new methodologies developed for strategic sample selection as detailed in: Stuart, Cole, Bradshaw, & Leaf (2011); Hedges & O'Muircheartaigh (in preparation); Tipton (2011). Because this is a quasi-experimental study, causal inference requires careful consideration of heterogeneity between treatment and control units. Both schools and students self-select for program participation, biasing estimates of local average treatment effects. Observable characteristics can be used to reduce such bias through the use of sample selection techniques such as propensity score matching. The central attempt to rectify the problems raised by non-random selection of schools involves treatment schools to comparable control schools on covariates, with quality of match compared with a relevant distance metric. The metric used for sample selection in the current round is Mahalanobis distance metric, which provides a Euclidean distance between schools' covariates weighted by the sample covariance matrix of those covariates across all Michigan high schools. The goal is to create a survey population of schools with covariate balance between treatment and control schools, with school-level unobserved heterogeneity consequently as similar as possible between treatment and control groups. The covariates used to match include district-level variables (e.g. percent of population over the age of 25 holding a bachelor's degree and per-capita income), and school-level variables such as graduation and dropout rate, percent free and reduced price lunch, student ethnic composition, average school performance on state assessments, and percentage enrolling in postsecondary 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 treatment 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. For the past six years we have been working with Michigan state administrative data (supported by two IES grants) and have access to information not only on school and teacher characteristics but student

achievement and college attendance information (see Keesler, Wyse, & Jones, 2008; Zhou, Keesler, & Konstantopoulos, 2010; Lynn & Keesler, 2008). We will use these state administrative files to compare the college matriculation pattern of the schools in this study with others in the state.

Analytic Approach

The primary research questions of this study are whether the students in the intervention schools have higher postsecondary matriculation rates and are more likely to select a STEM major in college. To answer these questions we will use a simple logistic regression to compare differences on the two outcome measures across the treatment and control schools. As this intervention is just concluding its second year of implementation, some of these analyses have been conducted, however, they do not have the precision one needs for a full effectiveness trial. Moreover we are in the process of continuing to analyze data from two years and our expectation is that our future scale-up of the intervention would allow us to build more rigorous models with more statistical power.

Measures

Instruments were specifically developed to measure each component of the intervention. There are two main sources of data collection; an initial baseline survey administered to students in all grades and a senior exit survey administered to 12th graders. Items on CAP student questionnaires were drawn from national student surveys, which facilitate direct comparison of CAP survey data with nationally representative samples. Data are also obtained through contact logs at each school site that measure time spent by each student in the CAP Center and services provided. Structured student interview protocols are also used to measure the usefulness of college visits. These sources of data allow us to examine the potential mechanisms that may be influencing the targeted goals of CAP, such as the role of mentoring in shaping attitudes towards mathematics and science. College enrollment and choice of major data are obtained from the senior exit survey. The CAP data are also augmented with additional data from school administrative records.

Data used in this study is restricted to students in the 12th grade during the 2011-2012 school year and were drawn from the first wave of student data collected in the fall of 2010 and a second wave collected in the spring of 2012. This sample includes 797 12th grade students from the four treatment and four control high schools. The survey response rate across the schools was 80 percent.

Methodology

Two outcome variables are evaluated in this study: college matriculation (to a two-year or four-year institution) and pursuit of a STEM major in college. The outcome variables are categorical variables and will be used as dependent variables in a series of analyses. The current study is an examination of preliminary results and due to the timing of the final data collection and the conference is limited to an analysis of the outcomes across treatment and control schools. Future analysis will include a comparison of means across schools, and an examination of student attitudes and behaviors within schools a two-level logistic regression (a two-level hierarchical generalized linear model using the logit link function) and we suspect with a larger sample size as we scale-up, the findings will be more robust.

There are three primary classes of identification strategies that will be used in evaluating program treatment effects: school-level panel analysis, school-level matching analysis, and multi-level (school- and student-level) analysis. Using a school-level panel data set (which is also used for our selection of control schools receiving CAP surveys) of all Michigan high schools based on the NCES Common Core of Data and data from the Michigan Department of Education, we will estimate a generalized linear model with school and district fixed effects, using both between- and within-school variation to estimate causal effects. A second analysis will use the same panel data set, but attempt to estimate causal effects through a general distance metric-based matching framework that can only use covariates collected through NCES and MDE, but has the comparative advantage of a larger sample of Michigan high schools to select as controls. A third analysis exploits information gathered at the student level through the CAP surveys and combines it with school and community characteristics. Students can be matched within treatment and control school pairs on their propensity to participate in the program, which can be estimated through a logistic regression (or implicitly addressed through a covariate distance metric). Causal effects at the student level can subsequently be analyzed through standard propensity score matching methods. Alternatively, students can be analyzed as nested within their schools through fixed effects regression, or through hierarchical linear modeling.

Findings to Date

Examining the relationship between the treatment effect of CAP on postsecondary ambitions between treatment and control schools confirm our original power estimation that with eight schools, it is difficult to detect an effect size of the intervention at the school level. Table 2a shows the simple logistic regression, because of the strategic matching selection of the schools in the sample, additional covariates were not included. Table 2b shows the effect of CAP on interest in STEM, which is significant and positive, the odds of students in the treatment schools reporting interest in a STEM major was 95% higher than students in the control schools conditioning on college-going rates and prior student achievement as measured by the ACT.

In a second analysis, a combination of college-going rate measures is analyzed to observe treatment effects for the pilot year of the study. Because the desired state data on outcomes is not yet available, schools in the state were matched to the urban and rural treatment school on the basis of 2008-2009 CEPI data (excluding the current treatment and control schools) and were contacted by CAP team members and polled for their college-going rates after the 2010-2011 school year. Treatment school college-going rates are taken from the senior exit survey administered at the end of the 2010-2011 school year asking seniors what their fall plans are. Eleven schools provided their college-going numbers for the rural schools, and nine for the urban schools.

The following results are presented as preliminary suggestive evidence of a treatment effect that can only be ultimately validated with a complete, consistent set of outcome measures, as well as an extended sample with a complete panel of data. The feasibility of detecting an effect size with such a small sample of schools—particularly with only two treatment schools—rests on the effectiveness of the matching algorithm used, which theoretically improves the precision and bias of estimates by reducing heterogeneity between treatment and control groups. In this case, treatment and control groups for each population (urban and rural schools) are of size one, which means that the estimates shown here correspond to a form of an unweighted synthetic control approach, in

which the average behavior of control schools over time is implicitly used as a counterfactually untreated version of the treatment school.

Covariate balance, as measured by t-tests on the matching covariates' difference from the treatment schools' covariate value, is achieved between the urban treatment school and urban control sample, but not between the rural schools. This is likely due to some combination of sampling error and potentially greater heterogeneity of rural schools on matching covariates. This also implies that the mean square error of treatment effect estimates for rural schools using this data should be larger, both as a function of greater bias and lower efficiency. Tables 3a and 3b show the breakdown of covariates between treatment schools and their corresponding control groups.

Using a panel of data for the school years beginning 2007, 2008, and 2010[2], some simple regressions of the total college-going rate on school treatment status are run. Results from these regressions should be cautiously interpreted, but are not devoid of information. Table 4 shows the coefficient estimate, p-value, and 95% confidence interval for the estimated effect of treatment assignment to CAP under each estimation strategy. Estimated treatment effects appear more homogeneously strong for the urban school. One possible explanation is the superior covariate balance between the sampled control schools and the urban school. Both fixed effects (FE) and random effects (RE) estimates are near .16 (and not significantly different from each other), also providing evidence that the matching strategy was successful. This idea is intuitively based on a Hausman test for FE and RE estimators (Hausman, 1978), in which a statistically significant difference between FE and RE estimates is interpretable as evidence against the RE assumption that the unobserved heterogeneity is uncorrelated with the treatment. In this situation, the test fails to reject the null hypothesis, suggesting that treatment status is "randomly assigned" in the sample used to estimate the treatment effect. In contrast, the rural school's estimates are less reliable and different from zero with greater significance, with the exception of the FE estimate. This result fits nicely into the FE/RE contrast interpretation: if we believe that the rural school's control sample was insufficiently matched to the treatment's covariates, then unobserved heterogeneity between the schools should be correlated with treatment status. Hence, the RE estimator is inconsistent, and the FE estimator should provide preferable estimates. While these results are not proof of a treatment effect, they appear under considerable data constraints, and they are consistent with a positive treatment effect.

Conclusion

As the demand for a college-educated population increases, so have the numbers of 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

[2] 2009-2010 data is currently unavailable, but will be released by CEPI in the near future.

specifically designed to be an intervention that comprehensively connects several important aspects of the college-going process. Preliminary evidence from CAP suggests that a whole-school approach improves misalignment between adolescents' college ambitions and postsecondary enrollment, and may ultimately increase the percentage of students going to a 2- or 4-year college. Additionally, students in the treatment schools may also benefit from the support in pursuing a STEM major in college.

We are conservative in our current estimations of the impact of the CAP intervention, as it is still early in our research for conclusive results. However, initial findings are positive, especially from additional qualitative case studies conducted outside of this analysis. Students may not be reaching their optimal level of (educational) human capital investment because of information limitations and other constraints. This study aims to reveal and enumerate those restrictions, potentially leading to cost-effective measures to enhance students' postsecondary educational matches, and ultimately career matches. In addition, the study provides a basis for developing and integrating new empirical strategies for identifying effect sizes in quasi-experimental, school-level designs constrained by funding. The development of effective methodologies for causal inference in cluster designs with a limited number of clusters increases the set of interventions that can be feasibly evaluated by researchers.

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Table 1a. Number of schools in the treatment and matched control schools

	Treatment		Control		Total Schools
	Urban	*Rural*	*Urban*	*Rural*	
2010-2011	1	1	1	1	4
2011-2012	2	2	2	2	8
2012-2013	4	4	4	4	16
*2013-2014**	*8*	*8*	*8*	*8*	*32*

****Projected***

Table 1b. Demographic characteristics of treatment and matched control schools

	Treatment		Control	
	Urban A	*Urban B*	*Urban C*	*Urban D*
Treatment Status	2010-2012	2011-2012	2011-2012	2011-2012
Enrollment	1,407	905	1,490	1,060
% Free and Reduced Lunch	60%	82%	74%	86%
% Underrepresented Population	62%	65%	69%	75%
	Treatment		Control	
	Rural A	*Rural B*	*Rural C*	*Rural D*
Treatment Status	2010-2012	2011-2012	2011-2012	2011-2012
Enrollment	425	688	563	303
% Free and Reduced Lunch	30%	20%	33%	24%
% Underrepresented Population	<1%	<1%	<1%	<1%

SOURCE: National Center for Education Statistics Common Core of Data

Table 2a. Estimated odds ratios from a logistic regression of postsecondary ambitions by prior college-going behavior, treatment status, and student ACT score

	Odds Ratio	**z**
School college-going rates 2008-2009	**1.04**	**4.29****
Treatment status 2010-2012	**.740**	**-0.91**
ACT score 2011	**1.20**	**5.66****

SOURCE: CAP Senior Exit Survey 2012; n= 727 (12th graders)

****p< 0.05 **p<0.01***

Table 2b. Estimated odds ratios from a logistic regression of STEM interest by prior college-going behavior, treatment status, and student ACT score

	Odds Ratio	**z**
School college-going rates 2008-2009	**1.01**	**.68**
Treatment Status 2010-2012	**1.95**	**2.14***
ACT score 2011	**1.21**	**6.09****

SOURCE: CAP Senior Exit Survey 2012; n= 727 (12th graders)

****p< 0.05 **p<0.01***

Table 3a. Demographic Characteristics of Estimation Sample

	% Going to College	Graduation Rate	Dropout Rate	Pupil-Teacher ratio	% FRPL	% Minority	School Size	ln(per capita income) for school district
Urban								
Treatment	**73.00%**	**66.35%**	**18.10%**	**22.90**	**59.28%**	**61.90%**	**1407.00**	**9.90**
Control Avg. (N=9)	**69.33%**	**71.89%**	**12.86%**	**20.51**	**57.76%**	**63.86%**	**1177.67**	**9.88**
Rural								
Treatment	**67.00%**	**87.22%**	**7.52%**	**17.10**	**30.11%**	**2.02%**	**445.00**	**10.05**
Control Avg. (N=11)	**71.50%**	**88.63%**	**5.44%**	**20.37**	**30.00%**	**5.77%**	**651.50**	**10.07**

Table 3b. Michigan Merit Examination Pass Rates for Estimation Sample

	Math	Reading	Science	Social Studies	Writing
Urban Schools					
Treatment	**35.00%**	**44.00%**	**37.00%**	**74.00%**	**25.00%**
Controls Avg. (N=9)	**23.67%**	**38.33%**	**30.33%**	**67.00%**	**22.44%**

Rural Schools					
Treatment	**42.00%**	**55.00%**	**51.00%**	**88.00%**	**37.00%**
Control Avg. (N=11)	**52.90%**	**63.90%**	**58.50%**	**85.40%**	**44.50%**

Table 4. Regression Estimates for Urban and Rural Samples

	POLS	**POLS & Year Dummies**	**Fixed Effects**	**Fixed Effects & Year Dummies**	**Random Effects**
Urban	**0.223**	**0.223**	**0.162**	**0.172**	**0.168***
p =	**0.17**	**0.17**	**0.08**	**0.1**	**0.04**
95% CI	**[-0.102,0.547]**	**[-0.102,0.547]**	**[-0.020,0.344]**	**[-0.034,0.377]**	**[0.004,0.332]**
Rural	**0.076**	**0.076**	**0.225**	**0.129**	**0.117**
p =	**0.48**	**0.48**	**0.05**	**0.2**	**0.25**
95% CI	**[-0.138,0.290]**	**[-0.138,0.290]**	**[-0.004,0.454]**	**[-0.075,0.333]**	**[-0.083,0.317]**