

The College Application Gauntlet:
A Systematic Analysis of the Steps to Four-Year College Enrollment

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Abstract

Few studies have examined the steps to college enrollment between college aspiration and college enrollment and how these steps might present a barrier to four-year college enrollment. This study used data from the Education Longitudinal Study: 2002 and employed a multivariate random effects logistic framework to examine the completion of nine steps to enrollment based on student background characteristics and the completion of prior steps. Racial and family income gaps in step completion can be mostly accounted for by differences in academic preparation. Accounting for social and cultural capital reduced, but did not eliminate, remaining gaps. Finally, completion of early steps strongly predicts completion of later steps, though this momentum appeared much stronger for White students than Black or Hispanic ones. The findings suggest college coaching programs should target students early in their high school careers and work to foster college aspirations and provide information about steps to college enrollment.

Keywords: steps to college enrollment, racial and income differences, four-year college aspiration, four-year college enrollment, human capital model

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Enrolling in college is harder than it might seem. Beginning at least a year before enrollment, students aspiring to attend a four-year college must sit for entrance exams, meet with college counselors, write application essays, and apply for financial aid. Many studies identify factors associated with the development of college aspirations and final enrollment decisions, but few have looked in a large-scale, systematic way at the steps a student must take between aspiration and enrollment. These studies do not consider the way these steps collectively present a complex labyrinth that students must navigate. This study aimed to examine how students traverse these intermediate processes.

In one of the few studies to explore these steps to college enrollment, Avery and Kane (2004) found that, among a sample of Boston-area high school seniors, many students did not enroll in a four-year university because they failed to complete some part of the application process. Though some students who intended to go to college took the SAT, they failed to complete their applications; other students did not take the SAT despite a stated interest in college. The process that leads from initial postsecondary aspirations to college application and enrollment is frequently interrupted. While Avery and Kane demonstrated the extent of this interruption in Boston, little is known about the process nationally, or how students' background and educational performance predict their likelihood of completing the steps of the postsecondary application process—how students go from intent to enrollment.

Despite similar goals, college access programs are remarkably scattershot with respect to the strategies they employ and the populations they serve (Gándara & Bial 2001; Perna, Rowan-

Kenyon, Bell, Thomas, & Li 2008). This stems in large part from how poorly we understand students' movement along the path from aspiration to enrollment—whether and how they decide to complete steps to enrollment such as taking the SAT, meeting with a college counselor, and completing applications for financial aid—and how this movement might differ for students from underserved populations. As a result, understanding this process has important implications for helping such programs more effectively direct their resources to the students they serve.

Thus, this study addressed two questions: (1) Is there a clear progression of steps that leads to college enrollment? And (2) to what extent do students from different backgrounds complete each step toward enrollment in a four-year college? To answer these questions, I draw on nationally representative data from the Education Longitudinal Study: 2002 (ELS). I use multivariate logistic regression methods to describe the steps in the college application process and model the relationship between step completion and high school students' background characteristics such as race, family income, and academic preparation.

Background

Research on College Aspiration and Enrollment

College attendance confers many well-documented benefits. Even when controlling for self-selection and ability, researchers have found that each additional year of schooling beyond high school can result in between 6 and 15 percent higher lifetime earnings (Card 2001). In addition to the monetary rewards, a college degree can lead to better health, greater civic engagement, and higher rates of employment (Baum & Ma 2007; Perna 2006). Despite these benefits, many students who could benefit from college attendance do not enroll. This lack of enrollment cannot be explained by a lack of college aspirations. Among the high school class of 2004, 68 percent of black students aspired to earn at least a four-year college degree (US

Department of Education 2006). Of those students, however, only nine out of every 20 actually enrolled in a four-year institution after high school graduation.

Most previous research on the college choice process falls neatly into the three stages of college choice: (1) “aspiration”, (2) “search”, and (3) “choice” (Hossler, Braxton, & Coopersmith 1989; Hossler & Gallagher 1987). The *aspiration* stage encompasses the development of students’ plans to attend college, *search* refers to students’ activity around gathering information about and applying to colleges and, *choice* describes how students ultimately choose in which college to enroll. The bulk of the college pathway research has been directed at the aspiration and choice phases of the process (Perna 2006).

College aspiration and enrollment rates are not uniform across racial and socioeconomic groups. Differences in students’ aspirations can be seen as early as the beginning of high school (Berkner & Chavez 1997; Kao & Tienda 1998). Here, students from minority and low socioeconomic status backgrounds aspire to college at lower rates than other students. These differences exist as college aspirations are becoming both the norm and increasingly independent of family background characteristics (Goyette 2008). Racial and family background differences are even more pronounced with respect to college enrollment. Many researchers have noted that the chances of a student enrolling in college increase with the student’s family’s income, even when using test scores to control for ability (Akerhielm, Berger, Hooker, & Wise 1998; Berkner & Chavez 1997; Ellwood & Kane 2000; Perna 2000; Plank & Jordan 2001). Given that a college education means higher earnings, particularly for students from disadvantaged backgrounds, one would expect higher college aspiration, as well as enrollment, from those students most poised to reap those benefits (Dale & Krueger 2002).

Disparities in college enrollment, however, cannot be explained by differences in aspirations alone. Group differences by race and family income are smaller when comparing the groups' college aspirations than when comparing actual college enrollment (Berkner & Chavez 1997). Ninety-three percent of Avery and Kane's sample of suburban Boston students who indicated at the beginning of twelfth grade that they planned to enroll in a four-year university still planned to enroll at the end of their senior year (2004). In contrast, only 36 percent of the corresponding sample of urban Boston students maintained the same belief throughout their senior year despite receiving college preparation coaching the suburban students did not. Thus, for these Boston students, differences in aspirations increased as the time of typical four-year college enrollment neared, indicating that there is not a direct path between aspiration and enrollment. Such an acknowledgement raises the obvious question: What causes students with college aspirations to abandon their plans?

This question suggests that research on the search stage of the college choice process needs an additional dimension. Most research focused on this stage has focused on describing how students gather information about colleges and choose the colleges to which they will apply (Perna 2006). This focus implicitly assumes that, given the decision to apply, the completion of applications is trivial. The handful of researchers who have recognized that there are important steps that must be completed during the search stage have noted differences in the rate of completion of the various steps between different groups of students. There has, however, been little commonality among these researchers about the group of examined steps or the sophistication of the methods or models used for analysis. In all cases, researchers have found that minority and poor students complete steps at lower rates than White and wealthy students.

Avery and Kane (2004) examined the most detailed list of college steps in the literature—including, among more commonly studied steps, taking the PSAT, meeting with a college counselor, visiting a college, and obtaining college applications. They noted disparities between a group of at-risk urban Boston students and their more privileged suburban peers in the rate of completion of steps to enrollment. Even among low-income students who had participated in the Boston College Opportunity and Career Help (COACH) college coaching program and had high educational expectations and valuations of college benefits, the completion rate of these steps was lower than that of wealthier students. However, the authors only give the step completion rate by the urban or suburban categories and do not attempt to control for other student characteristics.

In contrast to the nine activities presented by Avery and Kane, Cabrera and La Nasa (2001) identified three tasks they claim are most likely to result in college enrollment: students taking courses that at least minimally prepare them for college, graduating from high school, and applying to college. Each of these steps was examined within a multivariate logistic framework, rather than through the presentation of summary statistics. Though the tools of analysis employed in this study were more sophisticated and controlled for more factors than other studies, the depth of analysis was constrained by covering only three basic steps.

Other studies of the steps to college enrollment have analyzed a more diverse list of steps than Cabrera and La Nasa, but have not looked as systematically at the completion of those steps. For example, Berkner and Chavez (1997) did not study high school graduation, but did include taking the SAT. They described group differences in SAT taking based on students' academic qualifications and other background characteristics. They also performed a weighted linear probability model of college enrollment that controlled for race, family income, parents'

education, attaining college qualifications, and either taking the SAT/ACT and submitting a college application or not. The study did not, however, include a multivariate analysis of the factors that influence whether students complete any step other than college enrollment. Horn (1997) examined step completion based on student characteristics associated with an increased risk of dropping out of school. This study used a set of steps to college enrollment similar to Berkner and Chavez—including having college aspirations in tenth grade, obtaining minimal academic qualifications, taking college entrance exams, applying to college, and enrolling in college—but again employed a multivariate framework only with respect to enrollment in college rather than other steps to enrollment.

The prior studies have been constrained either by their methodologies or limited number of steps under consideration. Even when sophisticated methods are used, only a few steps are taken under consideration. When more steps are examined they are investigated using unsystematic methodologies. In all cases, the lack of consideration for prior step completion is problematic given the cumulative nature of the process. It also occludes any understanding of the interrelatedness of step completion: that is, the way completion, or incompleteness, of one step may greatly increase, or decrease, the likelihood of completion of other steps.

Steps as a Barrier to Enrollment

Rather than treat the completion of steps to enrollment as incidental to the process, this study considers each of the steps to enrollment as a serious barrier to college enrollment. A more complete understanding of how this process works could hold potential for creating high-leverage reform interventions.

In order to examine the intermediate steps to enrollment systematically, it is worth considering how different steps create different kinds of barriers to progress for students aspiring

to postsecondary enrollment. For example, some steps may take substantial effort while other steps may require prior planning or academic preparation. Because they provide frameworks well-suited to describing how students may consider such costs and navigate step completion, I use concepts from human, social, and cultural capital models to form the basis for describing how students make choices leading up to college enrollment.

The basic human capital model states that students decide whether to attend college by comparing the discounted lifetime earnings they expect to receive if they attend college to the direct (e.g., tuition) and indirect costs (e.g., foregone earnings) associated with attending college; if the costs outweigh the benefits, students will enroll in college (Becker 1962). According to this model, differences in rates of college attendance for students with the same ability to succeed at college should only exist if there are market failures such as imperfect capital markets for student loans or if differences in tastes for schooling exist. Therefore, given the ability to borrow, we would not expect to see students at the same ability level making different decisions about whether to attend college. However, as shown in the prior research discussed above and as shown again in the results below, this is not the case.

One likely reason for these findings is that human capital decisions are made under a great deal of uncertainty about future earnings and the likelihood of college completion. Some students have limited access to empirical data about the returns to education. They must therefore rely both on estimates of their own academic capabilities and the experiences and outcomes of students they know who have preceded them in enrolling in college (Manski 1993). Students also face uncertainty about their likelihood of completing a college degree and may change their decision to enroll if given new information about their ability to complete college

obtained as they complete steps to college enrollment (Altonji 1993). Such information may take the form of a new set of grades or SAT scores.

Human capital decisions become more intricate because students make their decision to attend college from within varying labor market environments. Students' responses to labor market conditions and income expectations have been shown to vary by race, class, and gender, which may reflect that certain groups are more or less optimistic about their chances of completing a degree or more or less skeptical about the benefits of a degree (Beattie 2002).

Taken together, these considerations greatly complicate the basic human capital model of the college attendance decision. The problem becomes more complex when we consider that college enrollment decisions are not, as the basic human capital model presumes, one-time decisions. Every student who wants to attend college must complete the lengthy and laborious college application *process*. This process requires students to clear a number of successive hurdles—taking standardized tests, writing application essays, applying for financial aid, etc.—each with its own separate cost calculations. The failure to complete any one of these steps limits students' ability to enroll in many colleges. Thus, at each step students must recalculate and reaffirm their human capital decision. For example, students likely weigh the cost of studying for and taking the SAT against not only the benefits of attending college but also the investment, or lack thereof, they have made in the completion of other steps in the enrollment process. All of this must be done in the midst of the uncertainty about college completion and future earnings that accompanies all human capital decisions. To the extent that groups of students make different decisions when faced with these choices, it is important to understand how the completion of different sets of steps leads to college enrollment, if at all, for different groups of students.

So far, the discussion of students' human capital decisions to complete the steps to college enrollment has presupposed that students know what those steps are, the order in which they must be done, and the timing of when they should be completed. Thus to the extent that race, family income or academic preparation are related to a student's completion of a given step, it may be because students with those attributes have more or less access to this information. Such information can come from students' cultural knowledge, from their social networks, or through the organizational environment of their high school. Formally, these factors refer to students' cultural and social capital (Bourdieu 1986, Coleman 1988), and what McDonough (1997) has described as "organizational habitus", respectively. More simply, this means that students can develop aspirations for college and learn about the college application process through the values and lessons taught to them by their families and learned in the environment in which they grew up; through social networks of friends and acquaintances; or through the culture and attributes of their high schools. For example, college educated parents are more likely to have the necessary knowledge and thus provide the cultural capital to guide their children through the steps to college enrollment.

Many researchers have demonstrated a connection between sources of social and cultural capital, school attributes, and students' college enrollment decision making (Ellwood & Kane 2000; Engberg & Wolniak 2010; Grodsky & Jackson 2009; Hossler, Schmit, & Vesper 1999; McDonough 1997; Paulsen & Smart 2001; Perna 2006; Perna & Titus 2005). Studying the connection between these sources of capital and students' *completion of steps* to college enrollment is important for two reasons. First, if these variables mitigate gaps in the likelihood of step completion of students from different races, family income groups, or academic preparation levels, they suggest one possible mechanism for helping students who fall to the wayside

between their initial college aspirations and ultimate college enrollment. In other words, if sources of social and cultural capital reduce observed gaps in step completion, then one way to help students complete more steps is to find ways make up differences in students' levels of these types of capital that can be affected by policy. For example, college counselors or college coaching programs can provide students with more information about the college application process, or work can be done to foster college-going cultures at high schools with low college attendance rates. Second, to the extent that these variables are also associated with students' completion of the steps to college enrollment, it suggests a mechanism by which the connection between social and cultural capital and college enrollment operates.

Though the primary focus of this article is to describe the progression through the steps to college enrollment of students from different race, family income, and academic preparation groups, I also include analyses that account for recognized sources of social and cultural capital, as well as variables that describe students' high school environments. I then comment on how the associations between race, family income, and academic preparation change when these sources of capital are accounted for. This study did not address whether background characteristics, such as gender, race, family income or academic preparation, affect students' choice-sets regarding steps to college enrollment or the choices that they make within those sets. It did, however, identify which choices are most strongly associated with each of these background characteristics. This provides information for future research investigating the causal pathway of the observed outcomes. By looking at each step in a consistent way, this study is able to identify clearly the relationship between race, family income, academic preparation, and step completion.

The focus here was on four-year and not two-year college enrollment for two reasons. First, four-year colleges generally have more numerous and more restrictive admissions

requirements than two-year colleges and thus these steps to four-year college enrollment create more and larger barriers for students who wish to pursue a four-year degree. Second, while students with four-year degree aspirations may initially enroll in two-year programs with the hope of transfer to a four-year program, researchers have demonstrated that two-year college enrollment can be a diversion from four-year degrees (Grubb 1991; Alfonso 2006; Long & Kurlaender 2009). This fact creates even greater impetus for our need to understand the reasons why students with four-year degree aspirations do not initially enroll in four-year colleges.

Data

In this study I analyzed data from the Education Longitudinal Study: 2002 (ELS). The ELS is a nationally representative, survey-based dataset designed to track a single cohort of high school students from tenth grade through college and as they enter the workforce. The data contain information about students' family background, math and language achievement, grades, and pathway through high school and postsecondary education or the workforce. Data for this article came from the first three rounds of ELS data collection, which surveyed students in 2002 when the students were in tenth grade, and again in 2004 and 2006. The ELS sample began with over 15,000 tenth graders from 750 schools in 2002. Though additional students were added to the sample in the second survey round, the present study relied on data from students who appeared in every data collection round since tenth grade. This was done in order to focus on students throughout the college application process and how the completion of early steps might impact the completion of later steps. I limited the sample to students who were observed in all three rounds of data collection, progressed on time to their high school degree and were not

missing variables that identified whether the students completed particular steps. The final sample contained 8,960 observations.¹

Background Characteristics of the Sample

Descriptive statistics of students in the ELS sample for basic characteristics of interest—including gender, race, socioeconomic status, and academic preparation—are presented in Table 1. A complete table of descriptive statistics for all variables can be found in the Appendix. The sample was 54 percent female and a majority White (66 percent). Thirteen percent of students in the sample were Hispanic; 12 percent were Black. The ELS survey allowed students to identify as multiracial, but did not provide the opportunity for students to be any more specific so these students are included as a separate racial group that comprised roughly four percent of the sample. An additional five percent of the students were Asian or Pacific Islander, while less than one percent were Native American.

The income variable in ELS is a categorical variable of 13 income range categories. I combined these 13 income groups into 5 income groups. This was done to increase the ease of interpretation and to aid analyses by evening out the distribution of students between income groups (for example, several of the original income groups contained fewer than 100 observations). As shown in Table 1, these groups divided the data into rough quintiles, though the extent to which this was possible was constrained by the distribution of observations across the original 13 categories. As a result, two groups contain notably more and less than 20 percent of the observations: The group of students from families earning between \$25,001 and \$35,000 a year comprised 11 percent of the sample and those students who come from families earning more than \$75,000 a year—the top group identifiable in the data—made up 32 percent of the

¹ Because some outcomes were missing more data than others, the analyses were repeated with the maximum possible sample size available for each outcome. The results, available by request from the author, are not substantively different from those presented here.

sample. The middle income group captured students from families earning the national median income.

Student academic preparation was represented by the student's standardized ninth- and tenth-grade GPA, based only on students' grades in academic classes, and students' scores on the ELS language and math assessment administered in tenth grade. Mean student GPA (prior to standardization) was roughly the same between ninth (2.83) and tenth (2.78) grade. The ELS composite score is a combination of a student's scores on a reading and math test administered to all ELS subjects in the tenth grade. The average score on the ELS exam within the sample was 53, with a standard deviation of roughly 9.

Steps to College Enrollment

I tracked students as they progressed through nine steps of the four-year college admissions process. These steps include:

Bachelor's degree aspirations in tenth grade. I considered students as having aspirations for college if they indicated in the 2002 (tenth grade) survey that they expect at least to enroll in a four-year college, or if they did not know how far they will continue their education. High school students in doubt about their academic goals after high school probably know whether they want to enter postsecondary education after graduation, but may still need to decide how far to pursue this education.²

Bachelor's degree aspirations in twelfth grade. I considered students as having aspirations for college if they indicated in the 2004 (twelfth grade) survey that they expect at least to enroll in a four-year college, or if they do not know how far they will continue their

² The results are not qualitatively different if "do not know" is not counted as having college aspirations. Results from this alternative specification are available from the author upon request.

education. I accounted for college aspirations in both tenth and twelfth grade in order to consider the persistence of aspirations over time.

Attainment of minimal college qualifications. Like Berkner and Chavez (1997), I considered students to have achieved minimal qualification for college if they fell in the top 75 percent of students who intended to attend at least a four-year college in any of the following categories: cumulative GPA, SAT score, ACT score, tenth-grade ELS test composite score, or twelfth-grade ELS math composite score.³ This included any student with a GPA above 2.35, an SAT score at or above 900, or an ACT score at or above 19. Students were also classified as minimally qualified for college if they have completed four-years of English; 3 years each of social studies, math, and science; and two years of a foreign language.

Completion of college entrance exams (SAT or ACT). Students were counted as having taken the SAT or ACT if, in the 2004 round of the survey, they reported having already taken or were planning on taking either exam or if the ELS data contained their SAT or ACT score.

Consultation with a college counselor or college representative. Students were counted as having met with a college counselor or college representative if they reported having done so in the 2004 round of the survey.

The inclusion of this step is complicated by the fact that its completion represents many things. First, meeting with a college counselor is an important application step because it necessary to arrange for recommendations and transcripts to be sent to the schools to which a student wants to apply. Second, meeting with a representative from a college indicates a student

³ This follows the college qualification criteria established by Berkner and Chavez for the 1992 National Education Longitudinal Study (NELS), but I recalculate the 25th percentile cut-points using the new ELS: 2002 data. My scale further differs from Berkner and Chavez in that I do not include class rank data because this is not part of the ELS data. Furthermore, Berkner and Chavez used composite (English and math) NELS test results from students' senior year of high school. ELS administered a composite exam during tenth grade, but only a math exam during twelfth grade—I allow for students to be considered minimally college qualified if they fall in the top 75 percent of college aspiring students on either exam.

is considering applying to a particular school. Finally, all such interactions are an opportunity for a student to gain more information both about particular colleges and about the application process itself. Thus completion of this step can both indicate a student's progress toward college enrollment and provide students with information about how to complete additional steps.

Four-year college application submission. I counted students as having applied to a college if they reported applying to four-year colleges in either the 2004 or 2006 rounds of the surveys, if they reported being accepted to a four-year college, or if they enrolled in a four-year college.

The inclusion of applying to college seems trivial; it is, after all, highly unlikely that a student enrolls in a four-year college without having applied for admission. It is included, however, to highlight that there are many students who complete the steps prior to applying and do not enroll in a four-year college because they did not apply, as well as many students who apply without having completed prior steps and also do not enroll in a four-year college. Thus it is typically only those students who complete preparatory steps for college application *and also* apply to four-year colleges who ultimately enroll.

Financial aid application submission. Students were counted as applying for financial aid only if they also applied to a four-year college and reported applying for any form of financial aid. While this did not capture the full population of students who applied for financial aid, it allowed for analyses that did not conflate applicants for financial aid who intended to attend a two-year college and those that intended to attend a four-year college.

Admission to a four-year college. A student was counted as being accepted at a four-year college if they reported that they had received and acceptance to a four-year school or if the first postsecondary institution they enrolled in was a four-year school.

Enrollment in a four-year college. If a student listed any four-year college or university as their first college of enrollment, then I counted them as enrolled.

Figure 1 summarizes the percent of students who completed each of the steps. As suggested by previous literature, there is a decrease in the absolute percentage of students who complete each of the steps to college. Between 86 and 93 percent of students either entertained the possibility of attending a four-year college, took the SAT or ACT, or attained minimal academic qualifications for college. Over 20 percent fewer students completed the next set of steps, with 57 to 74 percent of students either visiting a college counselor or meeting with a college representative, applying to a four-year college, or applying for financial aid. After another 30 percent drop, only 48 percent of students ultimately enrolled in a four-year college or university.

Social and Cultural Capital

A student's level of social and cultural capital was captured by variables that represented the expectations of people in the student's life and the extent to which a student's family and friends had the ability to help with the college application process and encouraged the student to be successful. Specifically, these included variables about the college expectations a students' friends, family, teachers, counselors, and coaches had for the student. They also included whether a student's friends felt it was important to continue schooling after high school and whether the friends themselves were planning on attending college. Finally these variables captured whether the student's parents had earned either an Associate's or Bachelor's degree and included a factor composite variable capturing the extent to which the parents were actively involved in the students' education ($\alpha=0.687$).

I deliberately did not include some measures of social and cultural capital that have been used in previous studies (e.g. participation in sports or musical activities in Engberg and Wolniak 2010). This is because some of these indicators are often part of the steps to college enrollment in and of themselves. For example, participation in extracurricular activities, which are often considered in four-year college admissions decisions, can be interpreted as a step toward four-year college enrollment. Thus it is difficult to determine if participating in such activities is a source of cultural capital and thus increases the likelihood students enroll in college, or if students participate in these activities *because* they want to enroll in a four-year college.

School Context

I chose school context variables that represent the extent to which students may be a part of a strong college-going culture at their high school. This includes indicators of the percent of students enrolled in a college preparation curriculum, the percent that are enrolled in Advanced Placement or International Baccalaureate courses, the percent of seniors who attend four-year institutions, and a factor composite variable capturing the level of participation of students in college-going preparation activities such as college fairs and SAT courses ($\alpha=0.811$). I also included indicators of whether the school is public or private, whether it is urban or rural, the geographic region of the country in which it is located, and the percent of the student body that was limited- or non-English proficient. Further, the collection of school context variables captured various elements of a school's size including its total enrollment, the grades it spanned, and the size of the tenth grade class.

Missing Data

ELS has many observations with missing data, particularly among variables generated from school and parent surveys. Missing data among the independent variables were accounted

for by employing multiple imputation during analysis (Rubin 1987). No data were imputed for dependent variables. Multiple imputation has the advantage over various forms of mean imputation that it accounts for the uncertainty of the imputed values of missing data by combining parameter and standard error estimates from 10 draws of data from a predicted distribution of the missing data variables.⁴

Method

Analysis proceeds in two sections, each one addressing a main research question.

Question 1: Is there a clear progression of steps that leads to college enrollment?

Here, I provide descriptive statistics and break down the data to illustrate the paths various groups of students take to four-year college enrollment. I also compare the proportions of students who complete a given step conditional on having completed prior steps.

Question 2: To what extent do students from different backgrounds complete each step toward enrollment in a four-year college?

I ran eight sets of random-intercept logistic regressions that predict the likelihood of completion of each step to college enrollment. The first set controls for the group of basic control variables: gender, race, family income, and academic preparation and, in cases where it is clear that certain steps must have preceded others, I controlled for the completion of prior steps. Next, regressions predicting the likelihood of completing each step were each run three times. Each regression included interaction terms between prior step completion and either (1) race, (2) income, or (3) academic preparation controls. This allowed for the discussion of differential step completion trajectories of students by racial, socioeconomic, and academic groupings. Because

⁴ The multiple imputation estimates were comparable to analysis conducted with basic mean imputation with missing variable dummies. Results are available from the author upon request.

of their small sample size, Native American and multiracial students are dropped from the interaction analyses.

These first four sets of regressions provide the descriptive backbone of this study. They were repeated using the controls for measures of social and cultural capital, as well as measures of students' school environment. This second part of the analysis identifies the descriptive differences that are not readily explained by traditional forms of capital.

The prior steps I controlled for follow. I added a control for having had college aspirations in tenth grade to the models predicting every step except for tenth-grade aspiration itself. Prediction of the likelihood of applying to a four-year college, applying for financial aid, acceptance to a four-year college and enrollment at a four-year college included controls for twelfth-grade aspirations, taking college entrance exams, attaining minimal college qualifications, and meeting with a college counselor or college representative. The models that predict enrollment in a four-year college contained an additional control for students' application for financial aid. Because no student was accepted to a college without having applied, and no student enrolled without having both applied and been accepted, application to a four-year college and acceptance to a four-year college were not used as control variables.

In the regression predicting attainment of minimal academic qualifications for college, the academic preparation variables were dropped from the model to avoid colinearity: these variables are explicitly used in creating the minimum qualification variable. I ran an additional logistic regression predicting the likelihood of student attainment of minimal qualifications by completion of the minimum number of academic units, independent of qualification by other means such as test scores or GPA. This allowed for the GPA and ELS composite score controls to be included in the set of controls.

I incorporated random intercepts in order to account for the multi-level nature of the sample data. The students in the ELS data were sampled from within a particular sample of high schools. Thus, within my sample, there are clusters of 1 to 40 students from 730 schools. Such a design, as noted by others (Engberk & Wolniak 2010; Perna & Titus 2005), calls for methods that account for the shared variation of students within schools. The random intercept model partitions school-level error from student-level error and captures the combined effects of omitted variables and unobserved heterogeneity at the school level (Rabe-Hesketh & Skrondal 2008).

I thus estimated the general equation

$$p(\text{Step}_{ij}) = (1 + e^{-\mathbf{X}\boldsymbol{\beta}})^{-1}$$

where

$$\mathbf{X}\boldsymbol{\beta} = \beta_0 + \text{Stu}_{ij}\beta_1 + \text{Pri}_{ij}\beta_2 + \text{Int}_{ij}\beta_3 + \text{Cap}_{ij}\beta_4 + \text{Sch}_j\beta_5 + \zeta_j + \epsilon_{ij}$$

I predicted the likelihood that student i , attending school j completes a given step. Here, Stu_{ij} captures basic student characteristics such as race, family income, academic preparation, and gender; Pri_{ij} represents the steps prior to the one being predicted that the student has completed; Int_{ij} are interaction terms of prior steps completed and either race, family income, or academic preparation variables; Cap_{ij} is the collection of measures of social and cultural capital; Sch_j are controls for school characteristics; and ζ_j and ϵ_{ij} are school- and student-level error terms, respectively.

Regressions for all but three steps were performed using the entire population of students for whom data was available. Regressions of financial aid application and acceptance to a four-year college were limited to the 6,780 students who applied to a four-year college. Finally,

regressions of four-year college enrollment were limited to the 6,210 students who were accepted to a four-year college.

My analysis took advantage of the unusually rich data provided by the ELS, which made it possible to compare a uniform set of measures across a large set of steps to enrollment and look at the collection of factors that influence students both in terms of individual step completion—even after considering the completion of earlier steps—and over the entire admissions process. Without an experimental or quasi-experimental design, I could not account for all possible omitted variable bias, so one should avoid attributing causality to the factors that I test. The methods I employed allow for a broad look at the factors that affect individual step completion on the path to college enrollment and suggest fruitful areas for future research.

Results

Is there a clear progression of steps that lead to college enrollment?

As Figure 1 shows, there was a general decrease in the percentage of students that completed each individual admissions step, but these steps did not at first appear to represent a clear step-by-step path to college. In other words, it was not the case that the group of students who completed one step was comprised of all of the students who completed the step before, minus those who fell out of the process. For example, 77 percent of students who were minimally qualified for college also applied to college, while 6 percent of the students who applied to college were not college qualified. Similarly, 94 percent of students who, when asked in twelfth grade, had plans to enroll in a four-year college took college entrance exams and 10 percent of those students who took the exams did not express the desire to attend a four-year college.

This variability in the groups of students who completed each step is illustrated in Figure 2, which presents the percent of students who completed each step as well as the percent of students who also completed all prior steps (to the left of the given step in the figure). Thus we see that while 86 percent of students had four-year college aspirations in the twelfth grade, only 83 percent of students had the same aspirations in tenth grade. Even more dramatically, only 87 percent of the students who applied to a four-year college had completed all prior college application steps.

Such variability, however, was not evident in the population of students who ultimately enrolled in college. Indeed, despite the variation in completion of the steps to college enrollment of high school students overall, ninety-five percent of students who enroll in a four-year college or university completed five major steps. During the course of their high school career they had four-year college aspirations in tenth and twelfth grade, took the SAT or ACT, attained minimal college qualifications, and applied to a four-year college. If optional steps like applying for financial aid and meeting with a college counselor or college representative are included among these five steps, the process loses clarity because fewer students who enroll in a four-year college complete all of the steps.

In short, completion of these five steps—having bachelors aspirations in tenth and twelfth grade, taking the SAT or ACT, attaining minimal college qualifications, and actually applying to college—appears vital in determining which students ultimately enroll in college and which do not. Students who enroll in four-year colleges almost always complete all of these steps.

To what extent do students from different backgrounds complete each step toward enrollment in a four-year college?

Given that the completion of steps is an important determinant of college enrollment, it is important to understand how students move through these steps. The following sections describe how students from different backgrounds complete the various steps to college enrollment. First, the completion rate of each step based on race, income, and academic preparation groupings is presented. Second, I develop these findings with the results of the basic multivariate logistic regressions that predict step completion while controlling for race, family income, academic preparation, gender, and prior step completion. Third, I present the results of the regression analyses that add interaction terms of prior step completion with race, family income, and academic preparation. Finally, I discuss how the preceding results change when measures of social and cultural capital and school context are included.

Step completion by race, income, and academic preparation.

Table 2 presents the step completion rate of students grouped by race, family income, and performance on the ELS math and reading assessment, with significant differences tested using White students, middle income, and middle achievement score quintile groups as reference groups (the latter two roughly capturing median students) for race, income, and academic achievement comparisons, respectively.

Race. Racial group differences were small with respect to tenth-grade college aspirations, though gaps developed as students moved through the steps to college enrollment. As seen in Table 2, only Asians and Hispanic students differed significantly from the over 90 percent of White students who had college aspirations in the tenth and twelfth grades; significantly more Asian students, and significantly fewer Hispanic students, had four-year aspirations at each grade. Hispanic, Native American, and multiracial students decreased relative to other racial groups in terms of taking college entrance exams, falling as much as 16 percentage points behind

White students. Black students maintained rough parity with White students throughout these first three steps, but were 19 percentage points less likely to have attained minimal academic qualifications for college than White students; only Native Americans were less likely than Black students to attain minimal college qualifications.

The rate at which all students completed college applications fell steeply relative to the completion of earlier steps. As shown in Table 2, all groups fell between 11 and 24 percentage points compared to the percentage of each group who took college entrance exams. While there was a decline in percentage of White and Asian students who applied to college compared to the percent that attained minimal college qualifications, roughly the same percentage of Black students who were college qualified also applied to college. Furthermore, about 76 percent of Black students applied to college, about the same rate as White and multiracial students.

Most racial groups appeared to be accepted to four-year colleges in the same proportion to each other as they applied, though there were large differences by racial group in terms of who accepted offers of admission. Asian and White students enrolled at the same relative rates at which they were accepted. In contrast, while two-thirds as many Hispanics and Native Americans were accepted to four-year colleges as Asians, only about half as many enrolled in four-year colleges. Furthermore, Black students were accepted to four-year colleges at about the same rate as White students, but were about three-quarters as likely as White students to advance that acceptance to college enrollment.

Consideration of race differences on their own, therefore, reveals that gaps in step completion start small, but increase as students move through the steps from aspiration to enrollment. Further, the rate at which these gaps increase varies by step for the different racial groups.

Income and academic preparation. A similar and clearer pattern of increasing gaps in step completion rates was seen when step completion was broken down both by family income and by ELS composite score.⁵ Table 2 shows that, within each of these groupings, there was a strict decrease in the percentage of students who completed each step from high to low income and high to low academic preparation, gaps that grew larger as the application process progressed. As with racial differences, the smallest gaps existed between students with respect to their college aspirations in tenth grade—about 8 and 17 percent between the highest and lowest income and achievement groups, respectively. From tenth-grade aspirations, the gap between high and low income and high and low achieving students only grew larger with the exception of the proportion of students who visited their college counselor or met with a college representative, where the gaps tightened somewhat. The gap also shrank between income groups with respect to applying for financial aid. Though this difference was expected because of the lower need for financial aid among students from high-earning families, students from the highest income group applied for aid significantly more than students from the middle income group, and there was an 8 percentage point gap in completion rate between the high and low groups.

Gaps between income and academic preparation groups continued to increase even after students had applied to college. Students from higher income groups were significantly more likely, and those from the lowest income group significantly less likely, to be accepted at four-year colleges. When it came to college enrollment, the students from the highest income groups enrolled at a rate approximately 19 percent greater than the next lowest income group—those students from families earning between \$50,001 and \$75,000—and almost two times the rate of students from families earning under \$25,000. Likewise, the gap between highest and lowest

⁵ Similar results are found if academic preparation is measured by ninth- or tenth-grade academic GPA.

academic preparation group grew from 44 percentage points at the time of application, to 56 and 65 points for acceptance and enrollment, respectively.

Thus, based on Table 2, it appears that many differences that are observed in college enrollment rates between different race, income, and academic preparation groups had their origins in differential rates of step completion and thus began well before the point at which students were in a position to enroll in college. It is possible, however, that basic differences between race, income, and academic preparation groups present a simple description of a more complex problem. In either case, these results indicate that greater attention must be given to the individual steps and *process* of college application as a singular focus on enrollment rates obscures the differences in step completion rates.

The joint association of background characteristics and step completion.

Using multivariate logistic regression allows for the examination of how these many factors jointly contribute to the likelihood a student will complete a particular step. The results of these analyses are presented in Table 3. These analyses control for race, income, academic preparation, gender, and prior step completion, but not the prior-step-by-group interaction terms or sources of social and cultural capital.

Race. Many race differences in step completion were diminished or reversed when controlling for race, family income, gender, and academic preparation. This was supported by two findings. First, with these background characteristics held constant, Black students were more likely than White students to complete all steps to college enrollment except to attain minimal college qualifications (though they were marginally more likely to complete the required units to attain such qualification) and meet with a college counselor or representative. Second, Hispanic and Native American students, like Black students, were less likely to have

achieved minimal college qualifications, but were no less likely than White students to complete any other step in the process. In fact, the odds they had aspirations to attend a four-year college in either tenth or twelfth grade were at least 70 percent higher than for White students.

Family income. Including the additional controls also revealed that there were fewer group differences by income than were seen in the univariate analysis. As shown in Table 3, significant differences existed across all steps only for students in the highest income group. Specifically, all else equal, students from families in the highest income group were significantly more likely than students in the middle income group to complete every step in the admission process except apply for financial aid and meet with a college counselor or representative. Additionally, students from families in the second highest income group, earning between \$50,001 and \$75,000 a year, were marginally more likely to aspire to a four-year degree in tenth and twelfth grade and significantly more likely to enroll in any four-year college, but less likely than middle income group students to apply for financial aid. Students from the lowest income group were only different from middle income students in that they were significantly less likely to attain minimal college qualifications.

Academic preparation. Many of the shifts in racial and family income patterns of step completion from the pure descriptive analyses appear to be due to the strong influence of academic factors. While controlling for background characteristics moderated race and income differences in step completion, academic differences remained large. Students with better early high school grades and higher ELS composite scores were much more likely than students with lower GPAs and scores to complete every step of the admissions process. All effects were positive and, with the exception of the association between ninth-grade GPA and meeting with a college counselor or representative, significant.

Prior step completion. The repeated association of particular background characteristic variables with step completion is particularly notable. When controls for prior steps were included, the coefficients on the background characteristic variables represented the relationship between those background characteristics and the completion of the given step, independent of how those background characteristics were associated with the completion of prior steps. This means, for example, that it was not the case that high-income students completed all the steps more frequently than average income students as a result of a greater likelihood of having college aspirations in the tenth grade. Rather, high-income students, independent of college aspirations in tenth grade, were more likely than average income students to complete nearly every step in the admissions process.

This finding does not mean that prior step completion was irrelevant; student completion of steps to college enrollment was nearly always important in terms of predicting completion of later steps, though some steps were more predictive than others. For example, students with tenth-grade college aspirations had odds three to five times higher that they would complete most subsequent steps, up to actually applying to college. These effects were some of the largest in the entire analysis.

Both twelfth-grade college plans and taking the SAT or ACT were strongly predictive of four-year college application and enrollment. Thus, while it was difficult to skip any major steps in the admissions process and still enroll in college, not taking college entrance exams or not planning on attending college as of twelfth grade was particularly detrimental to the chances of applying to college.

In general, there were not significant differences between students who visited their college counselor or met with a college representative and those who did not. However, students

who visited with a college counselor or college representative were significantly more likely to apply to a four-year college—they had 1.9 times higher odds to do so. The effect of this step was comparable to the effect of having tenth-grade plans to attend college and was greater than that of attaining minimal college qualifications. The effect of visiting with a counselor was, however, relatively small compared to the effect of having twelfth-grade plans and taking SAT or ACT. Thus, although this step to college enrollment is never recorded on a college application, it appeared to have a more important role to play in the college application process than the steps that were likely to be required.

Finally applying for financial aid appeared to play a positive role in enrollment at four-year colleges—completion of an application for financial aid lead to 1.55 times higher odds a student will enroll in any four-year college than students who did not apply for financial aid.

Thus, by simultaneously controlling for race, family income, academic preparation, and the completion of prior application steps, I have shown that observed group differences in step completion were largely accounted for by differences in academic preparation. After controlling for all of these factors, racial differences in step completion nearly disappeared and sometimes reversed, and income differences were greatly reduced. Furthermore, even steps that were not explicitly required for college admission, such as visiting with a college counselor or college representative, were strongly associated with success on the path to college enrollment.

Social and cultural capital and school context. As shown in table 4, adding controls for social and cultural capital and school context eliminates most of the income-related differences described in the above analysis. This is not unexpected due to the high level of correlation between family income and many of these measures. Even considering this relationship, family income is still associated with the completion of some later steps in the process. First higher

income students are less likely to complete applications for financial aid. Second, students from the highest income group are more likely than middle-income students to enroll in college conditional on acceptance.

With respect to the association of non-income variables, the addition of controls for capital generally reduced the association between these variables and step completion, but in most cases statistically significant associations remained significant. Notable departures from this include the reduced association of race and twelfth grade four-year college aspirations. Here the inclusion of controls for various forms of capital left Asian, Hispanic, and multiracial students statistically indistinguishable from White students. Additionally, prior step completion was no longer associated with the likelihood a student met with a college counselor or representative or applied for financial aid once controlling for sources of capital.

Interaction effects and different pathways through the steps to college enrollment.

The inclusion of interaction terms in the regressions allows for the analysis of the different pathways different groups of students take through the steps to college enrollment by giving the likelihood that a student from a particular group who completed a particular step will complete a subsequent step. Specifically, the interaction coefficients reveal how the generally high association between prior and subsequent step completion varies for different groups of students. The results of the prediction of step completion with race, income, and academic preparation group interactions are presented in Tables 5, 6, and 7 respectively. Table 8 presents the results of the race interaction analysis with school and capital variables included.

Prior step completion and race. As shown in Table 5, although the odds were high that Black and Hispanic students would have four-year degree aspirations in twelfth grade, these students did not maintain their aspirations from tenth grade at a rate as high as that of White

students. That is, the interaction between race and aspiration to a bachelor's degree in tenth grade revealed that Black students with tenth-grade bachelor's plans had odds 0.8 times as high as White students that they would have bachelor's aspirations in twelfth grade. Likewise, Hispanic students had odds 0.38 times as high as White students that they would maintain their aspirations from tenth to twelfth grade; however only the latter result reached conventional levels of significance. Though not true for Black students, a similar trend was true of college entrance examinations: Hispanic students had odds higher than White students that they would complete the entrance exam step, but their odds of completing this step conditional on having had bachelor's degree aspirations in tenth grade were half as large as for White students.

In fact, conditional on having had four-year college aspirations in tenth grade, Hispanic students completed all other steps to college enrollment, up to meeting with a college counselor and submitting an application, at lower rates than White students. In contrast, Black students who had tenth-grade four-year degree aspirations did not differ significantly different from White students in their taking the right number of units to attain minimal college qualifications or in meeting with college counselors or representatives.

In general, Black students had higher odds than White students of applying to four-year colleges, but had lower odds conditional on having completed certain other steps to college enrollment. Specifically, Black students with twelfth-grade college aspirations or who took the SAT or ACT had odds nearly half as high as White students that they would ultimately submit a college application. Hispanic students with four-year college aspirations in twelfth grade had odds that indicate they were significantly less likely to apply to four-year colleges than their White peers with the same aspirations.

Conditional on acceptance to a four-year school, Black and Hispanic students were generally just as likely as White students to enroll in a four-year college or university. Notably, while tenth-grade college aspirations were not significantly predictive of enrollment for students in general, both Black and Hispanic students who had expressed four-year college aspirations in tenth grade had odds over three times higher than White students with the same aspirations that they would enroll in a four-year college, conditional on acceptance.

Prior step completion and family income. There were fewer group differences in step completion pathways based on family income group interactions. As shown in Table 6, only students from families earning more than the reference group of students from families with roughly median family income (between \$35,001 and \$50,000) were significantly more likely to have four-year degree aspirations in tenth grade. While all students who had four-year college aspirations in tenth grade were significantly more likely to complete subsequent steps—through applying to college—students from these high income groups were more likely to maintain their aspirations into twelfth grade. This distinction is notable because students who completed this step had odds over 4.3 times greater than students who did not complete this step that they would enroll in a four-year college.

Prior step completion and academic preparation. Table 7 presents the interaction effects of prior step completion and academic preparation. High tenth-grade GPAs and ELS composite scores were associated with an increase in the odds that students who had bachelor's degree aspirations in tenth grade would maintain those aspirations into twelfth grade. A high ninth grade GPA was associated with a higher likelihood that students with tenth grade bachelors aspirations would take the SAT or ACT. Furthermore, students with higher tenth-grade GPAs and ELS composite scores were significantly more likely to apply to four-year colleges if they took the

SAT or ACT. In contrast, academic measures had little differential effect on whether students attain minimal college qualifications, met with a college counselor or representative, or applied for financial aid given that they have completed any prior steps.

Prior step completion, social and cultural capital, and school context. Table 8 presents the interaction analysis of prior steps and race from models that include controls for various forms of capital and school context. I focus here on the race interactions because the inclusion of measures of capital makes the interpretation of the income interactions murky and because the inclusion of these additional controls changed in the academic preparation interaction analysis.

With various forms of capital accounted for, minority students generally looked similar to their White peers as they moved through the steps to college enrollment. Hispanic (and Asian) students were still significantly less likely than White students to maintain their college aspirations from tenth to twelfth grade. For steps where Black and Hispanic students lagged behind their White peers in step completion before, the inclusion of controls for various sources of capital shows them completing these steps, conditional on prior step completion, at or above the rate of White students.

Although some differences between racial groups' conditional step completion went away with the controls for forms of capital, others persisted. For example, Black students who had four-year college aspirations in tenth grade still had odds over three times higher than similar White students that they would enroll in a four-year college. Hispanic students had similarly high odds, though the estimates were not statistically significant at any conventional level.

Conclusion

To summarize the findings, there were five major steps that nearly every student who enrolled in a four-year college completed: (1) aspiring to a four-year degree in tenth grade, (2)

maintaining that aspiration into twelfth grade, (3) taking the SAT or ACT, (4) attaining minimal college qualifications, and (5) applying to college. Because so few students enrolled in college without completing these five steps, a student's decision to complete any one of these steps was tantamount to deciding whether he or she would enroll in college. Yet the decreasing numbers of students who completed the various steps between stating four-year college aspirations in tenth grade and actually enrolling in a four-year college suggest that these and other steps to college enrollment presented some form of barrier for students who desire to enroll in college. These decreases in step completion were more extreme among racial minorities and students from low-income families. Many of these race and SES gaps could be accounted for, however, by controlling for students' academic preparation: The gaps between White and minority students and richer and poorer students were greatly reduced when comparing students of similar academic ability. The addition of capital controls nearly eliminated income-based gaps and reduced some of the association of race with early steps. Furthermore, the completion of steps early in the process was highly predictive of completion of later steps suggesting that there was a certain momentum students gained as they moved closer to college enrollment. Because prior step completion was more indicative of subsequent step completion for White students, this momentum appeared to be stronger for them than Black or Hispanic students. Thus, while academic factors could help explain race- and income-based gaps in step completion, minority students still navigated the series of steps to college enrollment differently than White students. Measures of social and cultural capital could account for some, but not all of this phenomenon.

These results confirm that the path students take from their initial four-year college aspiration to finally enrolling is, in fact, quite complicated. There is a great deal to be learned about this path that can help explain why there are such a large number of students who aspire to

a college degree but do not ultimately enroll in college. Much can be explained by students' differing academic abilities—indicating that less able students might modify their college goals to suit their abilities—but even if academic ability is accounted for there are still differences in the completion of steps by racial and family income groups that remain.

Sources of cultural and social capital reduced race and income gaps in step enrollment further still. This indicates that sources of social and cultural capital guide students to college enrollment by providing them information and encouragement for navigating the steps required to enroll. Thus, it appears that students with similar access to this capital, regardless of race or income, appear to complete the steps to college enrollment at similar rates. This conclusion conforms to McDonough's findings that students whose schools, families, and friends were well-positioned to support students through the college search process were ultimately more successful in enrolling in college (1997).

The connection between social and cultural capital, school context and completion of steps to college enrollment highlights an important type of uncertainty with respect to student's decisions to complete these steps. While the human capital model outlined earlier incorporates students' uncertainty about their abilities and the returns to education, these results point to the relevance of another type of uncertainty: uncertainty about the process itself. For example, when controlling for background characteristics, but not sources of capital, Black and Hispanic students were more likely than their White peers to complete most individual steps to college enrollment, but were less likely to complete particular sequences of steps. This indicates a certain haphazardness to the steps to college enrollment completed by these minority students. These students appear to pick and choose steps to complete so that any given step appears to be cleared at a relatively high rate, but few students string together the series of steps that lead to college

enrollment. This suggests a lack of information about how to navigate the steps to college enrollment.

The claim that students sometimes do not complete steps to college enrollment because of uncertainty about how to navigate those steps is bolstered by another finding. Having met with a college counselor or college representative is a surprisingly strong indicator of subsequent step completion given that it is not part of the five major steps to college enrollment described in this study nor is it required to enroll in college. This importance of college counselors to the college search process has been noted by others (McDonough 2005; Plank & Jordon 2001). Though it can be as predictive of step completion as having aspirations to attend a four-year college in tenth grade, visiting with a college counselor or representative is the step for which completion is *least associated* with students' race or family income. Thus while it is the most democratic of the steps, it appears to be related to sources of capital given that the inclusion of social capital variables eliminates the association between tenth grade aspirations and visiting a college counselor. This finding suggests that it is those students with higher levels of capital that are better able to utilize counselors as a resource. Understanding this dynamic could have important implications for college access programs which seek to assist students in the completing the steps to college enrollment.

Whatever the reasons that steps to college enrollment present a barrier to students aspiring to enroll, the results of this study suggest ways to target efforts to reduce gaps between college aspiration and enrollment. There are many strategies college coaching programs use to help their students reach college. Based on this study, promising strategies are those that recognize the five particularly important steps in the process and give special attention to helping students complete them. In particular, it is important to recognize the impact the

completion of early steps in the process has on the completion of later steps. Additionally, having college aspirations as early as tenth grade appears to be more highly associated with college enrollment for minority students, conditional on the completion of other steps, even after accounting for sources of capital. Because of this, programs that target students early in their high school career, help foster their college aspirations into twelfth grade and support them as they take the SAT or ACT are likely to be most successful. One way to do this might be to support more effective college counseling as early as sophomore year of high school. Another promising strategy to increase step completion is to work to create college-going cultures in high schools with low college enrollment rates. This would help increase the amount of cultural capital students have access to, bolstering their likelihood of completing the steps to enrollment.

For their part, policymakers at four-year institutions should not interpret the finding that steps to college enrollment present barriers to students seeking to enroll in their colleges as a call to reduce admissions requirements. Rather, they need to be aware of how the requirements they do set can differentially impact students from different groups and seek to provide greater support in guiding potential applicants through the admissions process. Specifically, because the groundwork for applying to college—taking the right courses, taking the SAT or ACT, etc.—is set well before the traditional recruitment season in the fall of students' senior year, four-year colleges that are serious about giving students from all backgrounds equal opportunity for admission should consider ways to make students aware of the requirements for college admission early enough that they have time to complete steps they may have missed.

This article uses a multivariate framework to describe a cohort of students whose step completion has not been previously examined. These methods go beyond previous descriptive studies of application step completion in that they systematically predict step completion

controlling for multiple background characteristics and previous step completion; no prior study has looked at this set of steps in this way. While these methods allow for the careful description of group differences and the measurement of associations between step completion and various other factors, they do not allow for causal claims. Future research should attempt to describe more thoroughly the causal mechanisms behind these results. While we do not yet understand the mechanisms in play, this study demonstrates that it is crucial that attempts to understand and improve college enrollment outcomes consider the steps that lead to college enrollment.

References

- Akerhielm, K., Berger, J., Hooker, M., and Wise, D. (1998). *Factors related to college enrollment: Final report*. United States Department of Education. Washington, DC.
- Alfonso, M. (2006). The impact of community college attendance on Baccalaureate attainment. *Research in Higher Education, 47*, 8, 873-903.
- Altonji, J. (1993). The demand for and return to education when education outcomes are uncertain. *Journal of Labor Economics, 11*, 1, 48-83.
- Avery, C. and Kane, T. (2004). Student perceptions of college opportunities: The Boston COACH Program. In C. Hoxby (Ed.) *College choices: The economics of where to go, when to go, and how to pay for it* (pp. 355-391). Chicago: University of Chicago Press.
- Baum, S. and Ma, J. (2007). *Education pays: 2007 the benefits of higher education for individuals and society*, Princeton, NJ: The College Board.
- Beattie, I. (2002). Are all adolescent econometricians created equal? Racial, class, and gender differences in college enrollment. *Sociology of Education, 75*, 1, 19-43.
- Becker, G. S. (1962). Investment in human capital: A theoretical analysis. *The Journal of Political Economy, 70*, 5, 9-49.
- Berkner, L., and Chavez, L. (1997). *Access to postsecondary education for the 1992 high school graduates*, US Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics. Washington, DC.
- Bourdieu, P. (1986). The forms of capital. In J. G. Richardson (Ed.) *Handbook of Theory and Research for the Sociology of Education* (pp. 341-258). New York: Greenwood Press.
- Cabrera, A. and La Nasa, S. (2001). On the path to college: Three critical tasks facing America's disadvantaged. *Research in Higher Education, 42*, 2, 119-149.

Card, D. (2001). Estimating the return to schooling: progress on some persistent econometric problems. *Econometrica*, 69, 5, 1127-1160.

Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94, S95-S120.

Dale, S. and Krueger, A. (2002). Estimating the payoff to attending a more selective college: An application of selection on observables and unobservables. *Quarterly Journal of Economics*, 117, 4, 1491-1527.

Ellwood, D. T. and Kane, T. J. (2000). Who is getting a college education? Family background and the growing gaps in enrollment. In S. Danziger and J. Waldfogel (Eds.) *Securing the future: Investing in children from birth to college* (pp. 283-324). New York: Russell Sage Foundation.

Engberg, M. E. and Wolniak, G. C. (2010). Examining the effects of high school contexts on postsecondary enrollment. *Research in Higher Education*, 51, 132-153.

Gándara, P., and Bial, D. (2001). *Paving the way to postsecondary education: K-12 intervention programs for underrepresented youth*. U.S. Department of Education, National Center for Education Statistics. Washington, DC:

Goyette, K. A. (2008). College for some to college for all: Social background, occupational expectations, and educational expectations over time. *Social Science Research* 37, 2, 461-484.

Grodsky, E. and Jackson, E (2009). Social stratification in higher education. *Teachers College Record*, 111, 10, 2347-2384.

Grubb, W. N. (1991). The decline of community college transfer rates: Evidence from national longitudinal surveys. *Journal of Higher Education*, 62, 2, 194-222.

- Horn, L. (1997). *Confronting the odds: Students at risk and the pipeline to higher education*, US Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics. Washington, DC.
- Hossler, D., Braxton, J.M., and Coopersmith, G. (1989). Understanding student college choices. In J.C. Smart (Ed.) *Higher education: Handbook of theory and research* (Vol. 5, pp 231-288), New York: Agathon Press.
- Hossler, D. and Gallagher, K. S. (1987). Studying student college choice: A three-phase model and the implications for policymakers. *College and University*, 2, 207-221.
- Hossler, D., Schmit, J., and Vesper, N. (1999). *Going to college: How social, economic, and educational factors influence the decisions students make*. Baltimore: The Johns Hopkins University Press.
- Kao, G. and Tienda, M. (1998). Educational aspirations of minority youth. *American Journal of Education*, 106, 349-383.
- Long B. T. and Kurlaender, M. (2009). Do community colleges provide a viable pathway to a Baccalaureate degree? *Educational Evaluation and Policy Analysis*, 31, 1, 30-53.
- Manski, C. (1993). Adolescent econometricians: How do youth infer the returns to schooling? In C. Clotfelter and M. Rothschild (Eds.) *Studies of supply and demand in higher education* (pp. 43–57). Chicago: University of Chicago Press.
- McDonough, P. M. (1997). *Choosing colleges: How social class and schools structure opportunity*. Albany: State University of New York Press.
- McDonough, P. M. (2005). Counseling matters: Knowledge, assistance, and organizational commitment in college preparation. In W. G. Tierny, Z. B. Corwin, and J. E. Colyar

- (Eds.) *Preparing for college: Nine elements of effective outreach*. Albany: State University of New York Press.
- Paulsen, M. B. and Smart, J. C. (2001) (Eds.). *The finance of higher education: Theory, research, policy, and practice*. New York: Agathon Press.
- Perna, L. W. (2000). Differences in the decision to attend college among African Americans, Hispanics, and Whites. *The Journal of Higher Education*, 71, 2, 117-141.
- Perna, L. W. (2006). Studying college choice: A proposed conceptual model. In J. C. Smart (Ed.), *Higher education: Handbook of theory and research* (Vol. 21, pp. 99-157). New York: Springer.
- Perna, L. W., Rowan-Kenyon, H., Bell, A., Thomas, S. L., and Li, C. (2008). A typology of federal and state programs designed to promote college enrollment. *The Journal of Higher Education*, 79, 3, 243-267.
- Perna, L. W. and Titus, M. A. (2005). The relationship between parental involvement as social capital and college enrollment: An examination of racial/ethnic group differences. *The Journal of Higher Education*, 76, 5, 485-518.
- Plank, S.B. and Jordan, W. J. (2001). Effects of information, guidance, and actions on postsecondary destinations: A study of talent loss. *American Educational Research Journal*, 38, 4, 947-979.
- Rabe-Hesketh, S. and Skrondal, A. (2008). *Multilevel and longitudinal modeling using Stata*. College Station: Stata Press.
- Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. New York: John Wiley & Sons.

US Department of Education (2006). National Center for Education Statistics. Education Longitudinal Study (ELS), 2002 & 2006: Base Year and Second Follow-up.

Table 1
Selected Sample Summary Statistics

| | Percent of sample | Mean (SD) |
|------------------------------|----------------------|-----------------|
| Race/Ethnicity | | |
| White | 65.75 | |
| Hispanic | 12.76 | |
| Black | 12.22 | |
| Multiracial | 4.75 | |
| Asian | 3.81 | |
| Native American | 0.71 | |
| Gender | | |
| Female | 54.53 | |
| Family Income | | |
| \$0-25,000 | 16.13 | |
| \$25,001-35,000 | 10.83 | |
| \$25,001-50,000 | 18.57 | |
| \$50,001-\$75,000 | 22.82 | |
| Over \$75,001 | 31.64 | |
| Academic Preparation | | |
| GPA – 9 th grade | | 2.83 (0.82) |
| GPA – 10 th grade | | 2.78 (0.83) |
| ELS Composite Score | | 52.95 (9.38) |

Note. Table gives weighted percent of sample that falls into each race, gender, and income category. Means and standard deviations are provided for academic preparation variables.

Table 2

Percent of Students who Completed Steps to Four-Year College Enrollment, by Group

| | Bachelor's aspirations, 10th grade | Bachelor's aspirations, 12th grade | Took SAT or ACT | Minimal academic preparation | Met with college counselor or representative | Applied to four-year college | Accepted at four-year college | Applied for financial aid | Enrolled in four-year college |
|-------------------------------|------------------------------------|------------------------------------|-----------------|------------------------------|--|------------------------------|-------------------------------|---------------------------|-------------------------------|
| Race/Ethnicity | | | | | | | | | |
| White | 92.9 | 87.1 | 92.0 | 93.1 | 75.3 | 73.8 | 69.0 | 58.0 | 53.4 |
| Asian | 95.6* | 92.2** | 91.2 | 93.9 | 73.4 | 80.5** | 72.1 | 63.5* | 59.5* |
| Black | 92.8 | 86.5 | 91.8 | 74.2*** | 72.2* | 76.2 | 64.4** | 66.7*** | 39.8*** |
| Hispanic | 89.8*** | 78.5*** | 80.1*** | 77.5*** | 67.0*** | 55.9*** | 46.7*** | 43.5*** | 28.9*** |
| Multiracial | 93.2 | 88.0 | 88.6* | 88.3** | 69.4* | 70.5 | 65.6 | 58.9 | 44.8** |
| Native American | 92.5 | 86.9 | 75.7*** | 52.5*** | 65.2+ | 63.7+ | 56.6* | 56.3 | 30.5*** |
| Family Income | | | | | | | | | |
| \$75,001+ | 95.9*** | 93.5*** | 95.2*** | 95.7*** | 76.0* | 82.9*** | 79.8*** | 58.7 | 66.7*** |
| \$50,001-75,000 | 93.8** | 87.3*** | 90.9** | 90.5* | 73.4 | 72.9*** | 66.9*** | 60.3 | 49.1*** |
| \$35,001-50,000 | 91.3 | 83.0 | 88.1 | 87.9 | 73.0 | 67.7 | 59.9 | 59.2 | 40.5 |
| \$25,001-35,000 | 89.4+ | 79.5* | 88.0 | 85.3* | 75.0 | 66.7 | 57.8 | 56.5 | 36.1* |
| \$0-25,000 | 88.0*** | 78.5*** | 83.8*** | 74.5*** | 68.2** | 57.4*** | 47.1*** | 49.5*** | 28.7*** |
| ELS Composite Quintile | | | | | | | | | |
| Top 20% | 99.2*** | 97.7*** | 98.9*** | 100.0 | 79.3** | 91.7*** | 90.7*** | 76.3*** | 80.0*** |
| 60-79 % | 96.8+ | 93.2*** | 96.1 | 100.0 | 78.0+ | 83.8*** | 80.3*** | 67.4*** | 64.6*** |
| 40-59% | 95.4 | 89.4 | 94.6 | 100.0 | 75.5 | 73.8 | 68.2 | 56.7 | 48.2 |
| 20-39% | 89.8*** | 81.1*** | 86.8*** | 88.5*** | 73.0+ | 63.3*** | 53.8*** | 50.4*** | 34.7*** |
| Bottom 20% | 82.0*** | 69.6*** | 74.8*** | 53.8*** | 61.6*** | 47.5*** | 34.9*** | 37.0*** | 15.4*** |

Note: Reference group for race is White, for income is \$35,001-50,000, and for ELS Composite is the 40-59th percentile.

+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001.

Table 3
Random Effects Logistic Regression of Steps to Four-Year College Enrollment

| | Bachelor's aspirations - 10th grade | Bachelor's aspirations - 12th grade | Took SAT or ACT | Attained minimal college qualifications...by any criterion | Attained minimal college qualifications...by units | Met with college counselor or representative | Applied to four-year college | Accepted at four-year college ^a | Applied for financial aid ^a | Enrolled in four-year college ^b |
|--|-------------------------------------|-------------------------------------|-----------------|--|--|--|------------------------------|--|--|--|
| Black | 2.734** | 2.467** | 3.128** | 0.251** | 1.195 | 1.146 | 3.282** | 1.68** | 2.223** | 1.336* |
| Asian | 2.460** | 2.049** | 1.174 | 1.282 | 1.276* | 0.969 | 1.462** | 0.687* | 0.900 | 1.339* |
| Hispanic | 1.710** | 1.352* | 0.927 | 0.357** | 1.113 | 0.894 | 1.096 | 0.868 | 1.001 | 0.906 |
| Native American | 2.658+ | 4.412** | 0.880 | 0.109** | 0.724 | 0.755 | 1.520 | 1.282 | 1.672 | 0.771 |
| Multiracial | 1.495+ | 1.552* | 1.06 | 0.704+ | 0.801 | 0.906 | 1.191 | 1.264 | 1.366+ | 0.852 |
| \$0-\$25,000 | 0.855 | 0.957 | 1.006 | 0.524** | 0.970 | 0.885 | 0.889 | 0.891 | 1.254 | 1.015 |
| \$25,001-35,000 | 0.816 | 0.886 | 1.092 | 0.871 | 1.183 | 1.080 | 1.184 | 1.030 | 1.181 | 1.044 |
| \$50,001-75,000 | 1.275+ | 1.245+ | 1.013 | 1.071 | 1.173+ | 0.958 | 1.154 | 1.149 | 0.765* | 1.278* |
| \$75,001+ | 1.620** | 2.216** | 1.804** | 2.201** | 1.252** | 0.936 | 1.563** | 1.733** | 0.327** | 2.151** |
| GPA - 9th Grade | 1.324** | 1.346** | 1.501** | | 1.397** | 1.072 | 1.332** | 1.191* | 1.360** | 1.180* |
| GPA - 10th Grade | 1.200* | 1.403** | 1.498** | | 1.699** | 1.393** | 1.700** | 1.931** | 1.265** | 1.562** |
| ELS Composite | 2.344** | 1.772** | 2.176** | | 1.365** | 1.139** | 1.420** | 2.118** | 1.148** | 1.499** |
| Female | 1.770** | 1.118 | 1.102 | 1.207* | 0.990 | 1.127* | 0.757** | 1.035 | 1.166* | 0.974 |
| Bachelor's aspirations - 10th grade | | 4.521** | 2.904** | 5.641** | 3.032** | 1.572** | 1.892** | 1.073 | 0.818 | 1.231 |
| Bachelor's aspirations - 12th grade | | | | | | | 5.354** | 2.754** | 1.268 | 4.302** |
| Took SAT or ACT | | | | | | | 6.084** | 1.415 | 1.518+ | 5.166** |
| Attained minimal college qualifications | | | | | | | 0.896 | 1.016 | 0.874 | 1.040 |
| Met with college counselor or representative | | | | | | | 1.974** | 1.348* | 1.226* | 1.429** |
| Applied for financial aid | | | | | | | | | | 1.547** |
| Variance component of the intercept ^c | 0.529** | 0.562** | 0.994** | 0.680** | 1.438** | 1.018** | 0.863** | 0.767** | 0.567** | 0.545** |
| Social and cultural capital controls | no | no | no | no | no | no | no | no | no | no |
| School context controls | no | no | no | no | no | no | no | no | no | no |
| N | 8,960 | 8,960 | 8,960 | 8,960 | 8,960 | 8,960 | 8,960 | 6,780 | 6,780 | 6,210 |

Note. Results presented as odds-ratios.

^a Of students who applied to a four-year college. ^b Of students who were accepted to a four-year college. ^c Stars indicate the lowest significance level of the random effect reached by all imputations.

+ p<0.10, * p<0.05, ** p<0.01

Table 4

Random Effects Logistic Regression of Steps to Four-Year College Enrollment with Capital Controls

| | Bachelor's aspirations - 10th grade | Bachelor's aspirations - 12th grade | Took SAT or ACT | Attained minimal college qualifications...by any criterion | Attained minimal college qualifications...by units | Met with college counselor or representative | Applied to four-year college | Accepted at four-year college ^a | Applied for financial aid ^a | Enrolled in four-year college ^b |
|--|--|--|-----------------|--|---|---|---------------------------------|---|--|---|
| Black | 1.565** | 1.357* | 1.697** | 0.221** | 1.005 | 1.029 | 2.866** | 1.751** | 1.990** | 1.343* |
| Asian | 2.012** | 1.310 | 1.488* | 1.221 | 1.346** | 1.009 | 1.484** | 0.665* | 0.956 | 1.338* |
| Hispanic | 1.351+ | 0.965 | 1.072 | 0.436** | 1.188 | 0.984 | 1.177 | 0.963 | 1.035 | 0.939 |
| Native American | 3.148+ | 4.972** | 1.189 | 0.147** | 0.893 | 0.929 | 1.894 | 1.556 | 1.532 | 0.861 |
| Multiracial | 1.420 | 1.262 | 1.072 | 0.690+ | 0.870 | 1.002 | 1.204 | 1.173 | 1.445* | 0.895 |
| \$0-\$25,000 | 0.952 | 0.939 | 1.019 | 0.562** | 0.988 | 0.860 | 0.902 | 0.986 | 1.266+ | 1.155 |
| \$25,001-35,000 | 0.809 | 0.828 | 1.046 | 0.879 | 1.166 | 1.076 | 1.172 | 1.018 | 1.178 | 1.096 |
| \$50,001-75,000 | 1.111 | 0.994 | 0.855 | 0.894 | 1.13 | 0.928 | 1.004 | 1.063 | 0.782* | 1.175 |
| \$75,001+ | 1.018 | 1.241 | 1.192 | 1.425* | 1.115 | 0.892 | 1.143 | 1.339+ | 0.376** | 1.636** |
| GPA - 9th Grade | 1.219** | 1.209** | 1.411** | | 1.357** | 0.998 | 1.273** | 1.157+ | 1.344** | 1.191** |
| GPA - 10th Grade | 1.172* | 1.406** | 1.420** | | 1.686** | 1.354** | 1.734** | 1.985** | 1.255** | 1.61** |
| ELS Composite | 1.963** | 1.499** | 1.945** | | 1.272** | 1.116** | 1.334** | 2.026** | 1.184** | 1.368** |
| Female | 1.496** | 0.922 | 0.903 | 1.083 | 0.948 | 1.030 | 0.722** | 0.972 | 1.124+ | 0.935 |
| Bachelor's aspirations - 10th grade | | 2.508** | 1.523** | 3.030** | 2.155** | 1.169 | 1.552** | 0.933 | 0.790 | 1.030 |
| Bachelor's aspirations - 12th grade | | | | | | | 3.776** | 2.321** | 1.288 | 3.321** |
| Took SAT or ACT | | | | | | | 4.423** | 1.213 | 1.426 | 3.739** |
| Attained minimal college qualifications | | | | | | | 0.926 | 0.988 | 0.932 | 1.051 |
| Met with college counselor or representative | | | | | | | 1.654** | 1.237+ | 1.129 | 1.356** |
| Applied for financial aid | | | | | | | | | | 1.596** |
| Variance component of the intercept ^c | 0.086 | 0.019 | 0.567** | 0.546** | 1.125** | 0.907** | 0.557** | 0.582** | 0.353** | 0.289+ |
| Social and cultural capital controls | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| School context controls | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| N | 8,960 | 8,960 | 8,960 | 8,960 | 8,960 | 8,960 | 8,960 | 6,780 | 6,780 | 6,210 |

Note. Results presented as odds-ratios.

^a Of students who applied to a four-year college. ^b Of students who were accepted to a four-year college. ^c Stars indicate the lowest significance level of the random effect reached by all imputations.

+ p<0.10, * p<0.05, ** p<0.01

Table 5
Step Completion and Prior Step by Race Interactions

| | Bachelor's aspirations - 12th grade | Took SAT or ACT | Attained minimal college qualifications... by any criterion | Attained minimal college qualifications... by units | Met with college counselor or representative | Applied to four-year college | Accepted at four-year college ^a | Applied for financial aid ^a | Enrolled in four-year college ^b |
|--|-------------------------------------|-----------------|---|---|--|------------------------------|--|--|--|
| Black x | | | | | | | | | |
| Bachelor's aspirations - 10th | 0.797 | 1.391 | 0.571+ | 1.775 | 1.194 | 1.895+ | 1.070 | 1.734 | 3.362+ |
| Bachelor's aspirations - 12th | | | | | | 0.619+ | 4.423** | 1.712 | 1.240 |
| Took SAT or ACT | | | | | | 0.511+ | 0.186* | 0.878 | 0.272 |
| College qualifications | | | | | | 0.914 | 1.358 | 1.008 | 0.712 |
| Met with college counselor or rep. | | | | | | 0.789 | 0.817 | 1.331 | 0.922 |
| Applied for financial aid | | | | | | | | | 1.558 |
| Hispanic x | | | | | | | | | |
| Bachelor's aspirations - 10th | 0.378** | 0.513* | 0.547* | 0.359** | 0.832 | 0.975 | 1.544 | 1.375 | 3.268+ |
| Bachelor's aspirations - 12th | | | | | | 0.603+ | 1.351 | 0.559 | 0.559 |
| Took SAT or ACT | | | | | | 1.537 | 0.503 | 1.446 | 0.290 |
| College qualifications | | | | | | 1.063 | 1.063 | 0.594 | 0.520 |
| Met with college counselor or rep. | | | | | | 0.998 | 1.646* | 1.659 | 0.781 |
| Applied for financial aid | | | | | | | | | 1.580+ |
| Asian x | | | | | | | | | |
| Bachelor's aspirations - 10th | 0.294* | 0.781 | 1.253 | 0.954 | 1.203 | 1.718 | 1.006 | 0.654 | 2.967 |
| Bachelor's aspirations - 12th | | | | | | 0.799 | 1.272 | 1.572 | 5.150 |
| Took SAT or ACT | | | | | | 1.323 | 0.570 | 0.251 | 0.354 |
| College qualifications | | | | | | 1.016 | 0.663 | 1.715 | 0.147+ |
| Met with college counselor or rep. | | | | | | 0.854 | 0.870 | 1.187 | 0.837 |
| Applied for financial aid | | | | | | | | | 1.370 |
| Variance component of the intercept ^c | 0.557** | 1.019** | 0.684** | 1.446** | 1.035** | 0.837** | 0.812** | 0.572** | 0.541** |
| Social and cultural capital controls | no | no | no | no | no | no | no | no | no |
| School context controls | no | no | no | no | no | no | no | no | no |
| N | 8,520 | 8,520 | 8,520 | 8,520 | 8,520 | 8,520 | 6,460 | 6,460 | 5,920 |

Note. Results presented as odds-ratios. All regressions include controls for race, family income group, academic preparation, gender, and prior step completion as in Table 3. Due to insufficient observations, multiracial and Native American students omitted from analysis.

^a Of students who applied to a four-year college. ^b Of students who were accepted to a four-year college. ^c Stars indicate the lowest significance level of the random effect reached by all imputations.

+ p<0.10, * p<0.05, ** p<0.01.

Table 6
Step Completion and Prior Step by Family Income Interactions

| | Bachelor's aspirations - 12th grade | Took SAT or ACT | Attained minimal college qualifications... by any criterion | Attained minimal college qualifications... by units | Met with college counselor or representative | Applied to four-year college | Accepted at four-year college ^a | Applied for financial aid ^a | Enrolled in four-year college ^b |
|--|--|-----------------|---|---|--|---------------------------------|---|---|---|
| \$0-\$25,000 x | | | | | | | | | |
| Bachelor's aspirations - 10th | 1.013 | 0.642 | 0.717 | 0.742 | 0.508* | 3.041** | 2.232 | 1.735 | 1.749 |
| Bachelor's aspirations - 12th | | | | | | 0.787 | 1.536 | 0.903 | 2.200 |
| Took SAT or ACT | | | | | | 0.936 | 0.166* | 0.107** | 0.828 |
| College qualifications | | | | | | 1.250 | 0.429+ | 1.241 | 0.577 |
| Met with college counselor or rep. | | | | | | 1.023 | 1.053 | 1.040 | 0.931 |
| Applied for financial aid | | | | | | | | | 2.102+ |
| \$25,001-\$35,000 x | | | | | | | | | |
| Bachelor's aspirations - 10th | 1.312 | 0.933 | 0.682 | 0.456+ | 0.475* | 1.671 | 1.657 | 2.894 | 2.041 |
| Bachelor's aspirations - 12th | | | | | | 0.684 | 1.339 | 0.800 | 0.527 |
| Took SAT or ACT | | | | | | 1.548 | 0.880 | 0.437 | 3E+07 |
| College qualifications | | | | | | 0.609 | 0.635 | 1.617 | 1.286 |
| Met with college counselor or rep. | | | | | | 1.388 | 1.002 | 1.311 | 1.141 |
| Applied for financial aid | | | | | | | | | 1.801 |
| \$50,001-\$75,000 x | | | | | | | | | |
| Bachelor's aspirations - 10th | 2.857** | 1.009 | 1.988* | 0.878 | 0.634 | 1.758 | 0.544 | 2.560 | 0.620 |
| Bachelor's aspirations - 12th | | | | | | 1.380 | 1.620 | 1.746 | 1.040 |
| Took SAT or ACT | | | | | | 1.112 | 0.678 | 0.140* | 2.558 |
| College qualifications | | | | | | 1.638 | 0.675 | 1.789 | 0.638 |
| Met with college counselor or rep. | | | | | | 1.190 | 1.068 | 0.935 | 1.505 |
| Applied for financial aid | | | | | | | | | 1.651+ |
| \$75,001 + | | | | | | | | | |
| Bachelor's aspirations - 10th | 2.308* | 0.889 | 1.400 | 0.609 | 0.934 | 2.245* | 1.132 | 2.021 | 0.826 |
| Bachelor's aspirations - 12th | | | | | | 1.523 | 0.895 | 0.963 | 0.772 |
| Took SAT or ACT | | | | | | 1.980 | 2.164 | 0.806 | 4.163 |
| College qualifications | | | | | | 2.007+ | 0.349* | 1.138 | 0.712 |
| Met with college counselor or rep. | | | | | | 1.200 | 0.897 | 1.415 | 1.307 |
| Applied for financial aid | | | | | | | | | 1.060 |
| Variance component of the intercept ^c | 0.546** | 1.005** | 0.692** | 1.445** | 1.036** | 0.838** | 0.778** | 0.575** | 0.538** |
| Social and cultural capital controls | no | no | no | no | no | no | no | no | no |
| School context controls | no | no | no | no | no | no | no | no | no |
| N | 8,520 | 8,520 | 8,520 | 8,520 | 8,520 | 8,520 | 6,460 | 6,460 | 5,920 |

Note. Results presented as odds-ratios. All regressions include controls for race, family income group, academic preparation, gender, and prior step completion as in Table 3. Due to insufficient observations, multiracial and Native American students omitted from analysis.

^a Of students who applied to a four-year college. ^b Of students who were accepted to a four-year college. ^c Stars indicate the lowest significance level of the random effect reached by all imputations.

+ p<0.10, * p<0.05, ** p<0.01.

Table 7
Step Completion and Prior Step by Academic Preparation Interactions

| | Bachelor's aspirations - 12th grade | Took SAT or ACT | Attained minimal college qualifications... by units | Met with college counselor or representative | Applied to four-year college | Accepted at four-year college ^a | Applied for financial aid ^a | Enrolled in four-year college ^b |
|--|-------------------------------------|-----------------|---|--|------------------------------|--|--|--|
| GPA - 9th Grade x | | | | | | | | |
| Bachelor's aspirations - 10th | 1.000 | 1.690** | 0.870 | 1.221 | 1.162 | 0.831 | 1.295 | 0.703 |
| Bachelor's aspirations - 12th | | | | | 1.362* | 1.381 | 1.143 | 0.881 |
| Took SAT or ACT | | | | | 1.050 | 0.546+ | 1.033 | 1.342 |
| College qualifications | | | | | 1.277+ | 1.364 | 1.273 | 1.122 |
| Met with college counselor or rep. | | | | | 1.000 | 0.939 | 0.790 | 1.184 |
| Applied for financial aid | | | | | | | | 1.037 |
| GPA - 10th Grade x | | | | | | | | |
| Bachelor's aspirations - 10th | 1.426* | 1.246 | 0.997 | 0.994 | 0.842 | 0.906 | 0.935 | 0.967 |
| Bachelor's aspirations - 12th | | | | | 1.171 | 1.057 | 1.270 | 1.921* |
| Took SAT or ACT | | | | | 1.828** | 1.784 | 1.192 | 1.392 |
| College qualifications | | | | | 1.458* | 1.283 | 1.293 | 0.689 |
| Met with college counselor or rep. | | | | | 1.003 | 1.132 | 1.249 | 0.757+ |
| Applied for financial aid | | | | | | | | 1.146 |
| ELS Composite x | | | | | | | | |
| Bachelor's aspirations - 10th | 1.980** | 1.132 | 0.860 | 0.802+ | 1.002 | 1.200 | 1.255 | 1.516+ |
| Bachelor's aspirations - 12th | | | | | 1.729** | 0.760 | 1.484+ | 1.375 |
| Took SAT or ACT | | | | | 1.360* | 1.534 | 1.306 | 2.082* |
| College qualifications | | | | | 0.938 | 0.987 | 1.520 | 1.161 |
| Met with college counselor or rep. | | | | | 1.096 | 0.918 | 1.192 | 1.209+ |
| Applied for financial aid | | | | | | | | 0.747* |
| Variance component of the intercept ^c | 0.536** | 0.985** | 1.443** | 1.039** | 0.834** | 0.777** | 0.576** | 0.537** |
| Social and cultural capital controls | no | no | no | no | no | no | no | no |
| School context controls | no | no | no | no | no | no | no | no |
| N | 8,520 | 8,520 | 8,520 | 8,520 | 8,520 | 6,460 | 6,460 | 5,920 |

Note. Results presented as odds-ratios. All regressions include controls for race, family income group, academic preparation, gender, and prior step completion as in Table 3. Due to insufficient observations, multiracial and Native American students omitted from analysis. Academic control variables were omitted from the prediction of attainment of minimal college qualifications by any criterion due to concerns of colinearity so results for this regression are not presented.

^a Of students who applied to a four-year college. ^b Of students who were accepted to a four-year college. ^c Stars indicate the lowest significance level of the random effect reached by all imputations.

+ p<0.10, * p<0.05, ** p<0.01.

Table 8
Step Completion and Prior Step by Race Interactions with Capital Controls

| | Bachelor's aspirations - 12th grade | Took SAT or ACT | Attained minimal college qualifications... by any criterion | Attained minimal college qualifications... by units | Met with college counselor or representative | Applied to four-year college | Accepted at four-year college ^a | Applied for financial aid ^a | Enrolled in four-year college ^b |
|--|-------------------------------------|-----------------|---|---|--|------------------------------|--|--|--|
| Black x | | | | | | | | | |
| Bachelor's aspirations - 10th | 1.091 | 1.780 | 0.813 | 1.873 | 1.126 | 1.888+ | 0.883 | 1.804 | 3.357+ |
| Bachelor's aspirations - 12th | | | | | | 0.725 | 4.057** | 1.595 | 1.349 |
| Took SAT or ACT | | | | | | 0.611 | 0.197* | 1.049 | 0.358 |
| College qualifications | | | | | | 0.909 | 1.380 | 1.115 | 0.722 |
| Met with college counselor or rep. | | | | | | 0.802 | 0.860 | 1.359 | 1.008 |
| Applied for financial aid | | | | | | | | | 1.462 |
| Hispanic x | | | | | | | | | |
| Bachelor's aspirations - 10th | 0.380+ | 1.054 | 1.493 | 1.015 | 1.245 | 1.656 | 0.867 | 0.708 | 3.043 |
| Bachelor's aspirations - 12th | | | | | | 0.914 | 1.143 | 1.527 | 5.515 |
| Took SAT or ACT | | | | | | 1.399 | 0.570 | 0.268 | 0.429 |
| College qualifications | | | | | | 0.976 | 0.681 | 1.705 | 0.172+ |
| Met with college counselor or rep. | | | | | | 0.931 | 0.925 | 1.243 | 0.800 |
| Applied for financial aid | | | | | | | | | 1.328 |
| Asian x | | | | | | | | | |
| Bachelor's aspirations - 10th | 0.476* | 0.768 | 0.774 | 0.410* | 0.921 | 1.002 | 1.518 | 1.624 | 3.139+ |
| Bachelor's aspirations - 12th | | | | | | 0.707 | 1.283 | 0.534 | 0.700 |
| Took SAT or ACT | | | | | | 2.105* | 0.446 | 1.650 | 0.319 |
| College qualifications | | | | | | 1.052 | 1.189 | 0.828 | 0.539 |
| Met with college counselor or rep. | | | | | | 0.997 | 1.610+ | 1.538 | 0.756 |
| Applied for financial aid | | | | | | | | | 1.586+ |
| Variance component of the intercept ^c | 0.009 | 0.576** | 0.551** | 1.134** | 0.922** | 0.547** | 0.640** | 0.359** | 0.280+ |
| Social and cultural capital controls | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| School context controls | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| N | 8,520 | 8,520 | 8,520 | 8,520 | 8,520 | 8,520 | 6,460 | 6,460 | 5,920 |

Note. Results presented as odds-ratios. All regressions include controls for race, family income group, academic preparation, gender, prior step completion, and measures of capital as in Table 4. Due to insufficient observations, multiracial and Native American students omitted from analysis.

^a Of students who applied to a four-year college. ^b Of students who were accepted to a four-year college. ^c Stars indicate the lowest significance level of the random effect reached by all imputations.

+ p<0.10, * p<0.05, ** p<0.01.

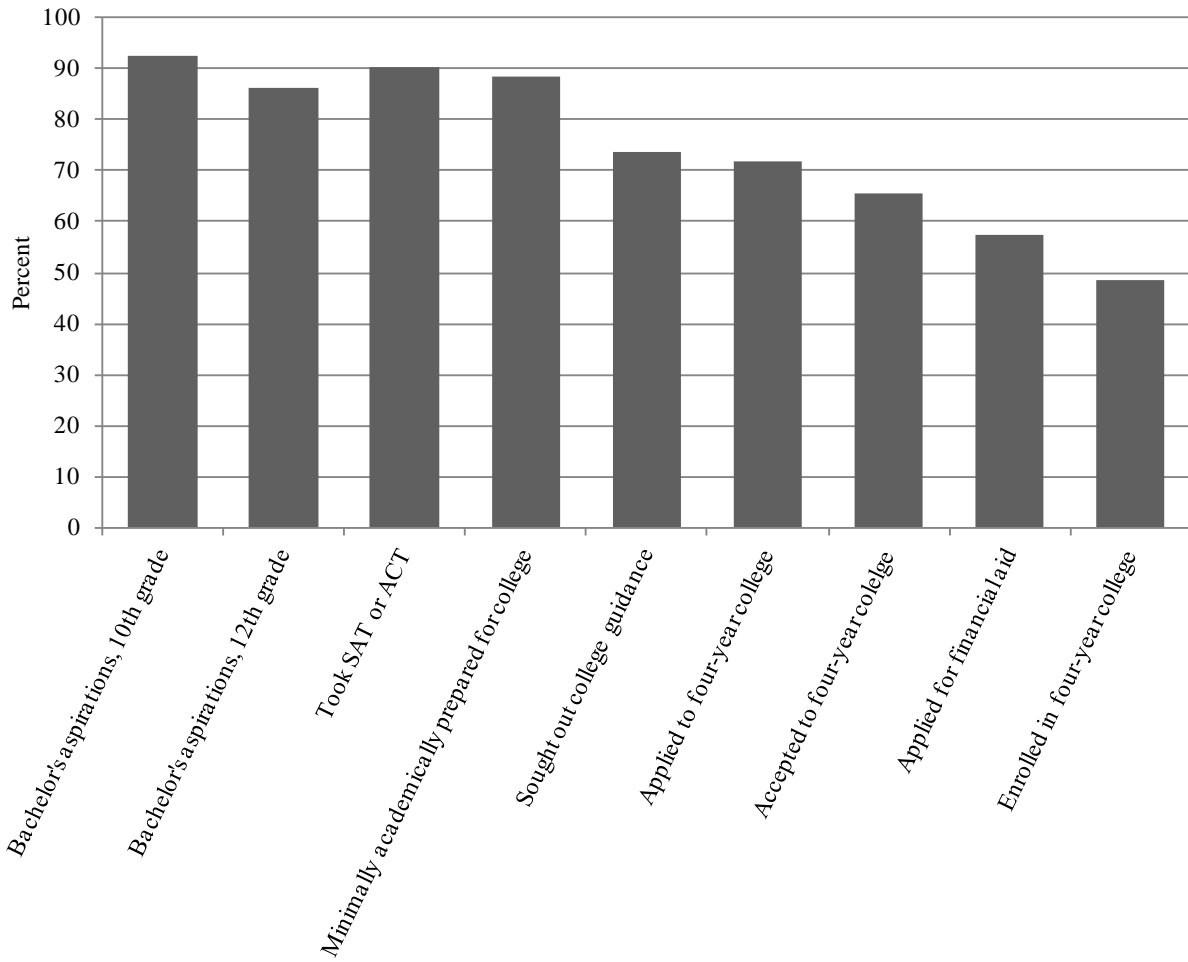


Figure 1. Percentage of all students who complete each step to enrollment.

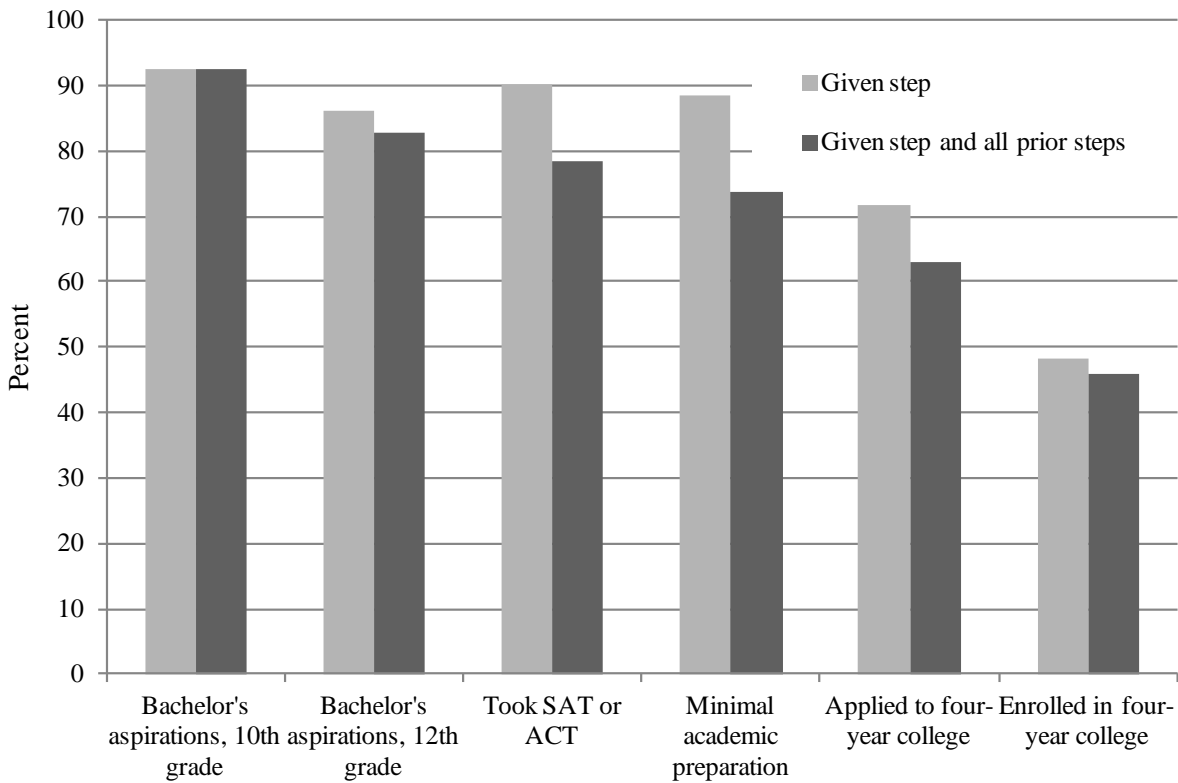


Figure 2. Step completion and conditional step completion for selected steps to enrollment. Bars give the percentage of all students who completed each step as well as the percentage of all students who completed each step as well as every step to the left of it in the figure.

Appendix

Descriptive Statistics for Sample Variables

| Variable | Non-missing observations | Sample-weighted mean | Std. Dev. | Min | Max | ELS:2002 Source variable(s) |
|---|--------------------------|----------------------|-----------|-------|-------|--|
| <i>Basic student characteristics</i> | | | | | | |
| Income | | | | | | |
| \$0-\$25,000 | 8,960 | 0.161 | 0.368 | 0.00 | 1.00 | BYINCOME |
| \$25,001-\$35,000 | 8,960 | 0.108 | 0.311 | 0.00 | 1.00 | BYINCOME |
| \$35,001-\$50,000 | 8,960 | 0.186 | 0.389 | 0.00 | 1.00 | BYINCOME |
| \$50,001-\$75,000 | 8,960 | 0.228 | 0.420 | 0.00 | 1.00 | BYINCOME |
| \$75,001+ | 8,960 | 0.316 | 0.465 | 0.00 | 1.00 | BYINCOME |
| Race/Ethnicity | | | | | | |
| White | 8,960 | 0.657 | 0.475 | 0.00 | 1.00 | BYRACE |
| Black | 8,960 | 0.122 | 0.328 | 0.00 | 1.00 | BYRACE |
| Hispanic | 8,960 | 0.128 | 0.334 | 0.00 | 1.00 | BYRACE |
| Asian | 8,960 | 0.048 | 0.213 | 0.00 | 1.00 | BYRACE |
| Multiracial | 8,960 | 0.038 | 0.192 | 0.00 | 1.00 | BYRACE |
| Native American | 8,960 | 0.007 | 0.084 | 0.00 | 1.00 | BYRACE |
| Female | 8,960 | 0.545 | 0.498 | 0.00 | 1.00 | BYSEX |
| ELS Composite score | 8,960 | 52.955 | 9.378 | 20.91 | 81.04 | BYTXCSTD |
| Grade 9 academic GPA | 8,760 | 2.827 | 0.821 | 0.00 | 4.00 | FIRAGP9 |
| Grade 10 academic GPA | 8,920 | 2.780 | 0.826 | 0.00 | 4.00 | FIRAGP10 |
| <i>Social and Cultural Capital</i> | | | | | | |
| Parents expect student to earn a four-year degree, grade 10 | 8,960 | 0.920 | 0.271 | 0.00 | 1.00 | BYPARASP |
| Parents' highest level of education is at least a Bachelor's degree | 8,960 | 0.453 | 0.498 | 0.00 | 1.00 | BYPARED |
| Parents' highest level of education is at least an Associate's degree | 8,960 | 0.226 | 0.418 | 0.00 | 1.00 | BYPARED |
| Parents' involvement with student's education | 7,300 | 0.040 | 0.990 | -1.79 | 4.62 | Factor composite of: BYP53B, BYP53C BYP53D, BYP56A, BYP56B, and BYP56C |
| Teacher/Counselor/Coach wants student to go to college, grade 10 | 3,840 | 2.561 | 0.943 | 0.00 | 3.00 | Composite of BYP66E, BYS66F, and BYS66G |
| Not important for friends to continue education past high school | 8,960 | 0.034 | 0.180 | 0.00 | 1.00 | BYS90H |
| Important to friends to continue education past high school | 8,960 | 0.458 | 0.498 | 0.00 | 1.00 | BYS90H |
| Parents expect student to earn a four-year degree, grade 12 | 8,960 | 0.892 | 0.310 | 0.00 | 1.00 | FIS43A, FIS43B |
| Friends expect student to earn a four-year degree, grade 12 | 8,620 | 0.611 | 0.488 | 0.00 | 1.00 | FIS44D |
| Teacher/Counselor/Coach wants student to go to college, grade 12 | 6,290 | 2.377 | 1.070 | 0.00 | 3.00 | Composite of FIS44E, FIS44F, FIS44G |
| No friends plan to attend four-year college | 8,960 | 0.037 | 0.188 | 0.00 | 1.00 | FIS65D |
| Most or all friends plan to attend four-year college | 8,960 | 0.602 | 0.489 | 0.00 | 1.00 | FIS65D |

| <i>School Context</i> | | | | | | |
|--|-----|-------|-------|------|------|----------|
| School Control | | | | | | |
| Public | 730 | 0.756 | 0.430 | 0.00 | 1.00 | BYCTRL |
| Catholic | 730 | 0.054 | 0.227 | 0.00 | 1.00 | BYCTRL |
| Other private | 730 | 0.189 | 0.392 | 0.00 | 1.00 | BYCTRL |
| Total school enrollment | | | | | | |
| 1-399 | 610 | 0.461 | 0.499 | 0.00 | 1.00 | BYSCENP |
| 400-599 | 610 | 0.142 | 0.349 | 0.00 | 1.00 | BYSCENP |
| 600-799 | 610 | 0.121 | 0.326 | 0.00 | 1.00 | BYSCENP |
| 800-999 | 610 | 0.072 | 0.258 | 0.00 | 1.00 | BYSCENP |
| 1,000-1,199 | 610 | 0.050 | 0.217 | 0.00 | 1.00 | BYSCENP |
| 1,200-1,599 | 610 | 0.075 | 0.263 | 0.00 | 1.00 | BYSCENP |
| 1,600-1,999 | 610 | 0.034 | 0.182 | 0.00 | 1.00 | BYSCENP |
| 2,000-2,499 | 610 | 0.031 | 0.173 | 0.00 | 1.00 | BYSCENP |
| Over 2,500 | 610 | 0.015 | 0.122 | 0.00 | 1.00 | BYSCENP |
| Location | | | | | | |
| Urban | 730 | 0.196 | 0.397 | 0.00 | 1.00 | BYURBAN |
| Suburban | 730 | 0.429 | 0.495 | 0.00 | 1.00 | BYURBAN |
| Rural | 730 | 0.375 | 0.484 | 0.00 | 1.00 | BYURBAN |
| Region | | | | | | |
| Northeast | 730 | 0.166 | 0.373 | 0.00 | 1.00 | BYREGION |
| Midwest | 730 | 0.277 | 0.448 | 0.00 | 1.00 | BYREGION |
| South | 730 | 0.352 | 0.478 | 0.00 | 1.00 | BYREGION |
| West | 730 | 0.205 | 0.404 | 0.00 | 1.00 | BYREGION |
| Grade span | | | | | | |
| Elementary (K-5) through 12 | 720 | 0.294 | 0.456 | 0.00 | 1.00 | BYSPANP |
| Middle (6-8) through 12 | 720 | 0.157 | 0.364 | 0.00 | 1.00 | BYSPANP |
| 9 through 10/11/12 | 720 | 0.530 | 0.499 | 0.00 | 1.00 | BYSPANP |
| 10 through 11/12 | 720 | 0.019 | 0.137 | 0.00 | 1.00 | BYSPANP |
| Percent free lunch eligible (grade 10) | | | | | | |
| 0-5 | 670 | 0.330 | 0.471 | 0.00 | 1.00 | BY10FLP |
| 6-10 | 670 | 0.076 | 0.264 | 0.00 | 1.00 | BY10FLP |
| 11-20 | 670 | 0.149 | 0.356 | 0.00 | 1.00 | BY10FLP |
| 21-30 | 670 | 0.150 | 0.357 | 0.00 | 1.00 | BY10FLP |
| 31-50 | 670 | 0.168 | 0.374 | 0.00 | 1.00 | BY10FLP |
| 51-75 | 670 | 0.081 | 0.273 | 0.00 | 1.00 | BY10FLP |
| 76-100 | 670 | 0.048 | 0.213 | 0.00 | 1.00 | BY10FLP |

| | | | | | | | |
|--|-----|--------|--------|-------|--------|--|--|
| Grade 10 enrollment | | | | | | | |
| 1-99 | 730 | 0.566 | 0.496 | 0.00 | 1.00 | BYG10EP | |
| 100-199 | 730 | 0.158 | 0.365 | 0.00 | 1.00 | BYG10EP | |
| 200-299 | 730 | 0.102 | 0.303 | 0.00 | 1.00 | BYG10EP | |
| 300-399 | 730 | 0.069 | 0.254 | 0.00 | 1.00 | BYG10EP | |
| 400-249 | 730 | 0.061 | 0.239 | 0.00 | 1.00 | BYG10EP | |
| 550-699 | 730 | 0.027 | 0.162 | 0.00 | 1.00 | BYG10EP | |
| over 700 | 730 | 0.016 | 0.126 | 0.00 | 1.00 | BYG10EP | |
| % 10th grade in college prep program | 730 | 61.354 | 36.243 | 0.00 | 100.00 | BYA14B | |
| % 10th grade are LEP or non-English proficient | 730 | 4.478 | 16.223 | 0.00 | 100.00 | BYA20 | |
| % 12th grade in college prep program | 730 | 66.474 | 33.420 | 0.00 | 100.00 | F1A18B | |
| Percent 2003 graduates went to four-year college | | | | | | | |
| 0-24 | 660 | 0.234 | 0.423 | 0.00 | 1.00 | F1A19A | |
| 25-49 | 660 | 0.273 | 0.446 | 0.00 | 1.00 | F1A19A | |
| 50-74 | 660 | 0.277 | 0.448 | 0.00 | 1.00 | F1A19A | |
| 75-100 | 660 | 0.216 | 0.412 | 0.00 | 1.00 | F1A19A | |
| Index of student participation in college-going preparation activities | 620 | 0.001 | 1.015 | -2.73 | 1.54 | Factor Composite of F1A20A, F1A20B, F1A20C, F1A20D, F1A20E | |
| Percent of students enrolled in AP or IB programs | 650 | 10.990 | 13.719 | 0.00 | 85.00 | F1A22G, F1A22F | |
