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Identifying Predictors of Credential Completion Among Beginning Community College Students

Jonathan M. Turk, Ph.D.

Senior Policy Research Analyst, Center for Policy Research and Strategy, American Council on Education

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Summary

Identifying Predictors of Credential Completion Among Beginning Community College Students

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This research brief is the second in a series of four, exploring outcomes for recent high school graduates who begin their postsecondary education in a community college using data from the Education Longitudinal Study of 2002. In this study, I tested the relationships between student demographic characteristics, pre-college academic preparation, college aspirations and plans, early postsecondary enrollment decisions, and academic and non-academic experiences at the students' first postsecondary institution and the probability of completing a credit-based sub-baccalaureate certificate, associate degree, or bachelor's degree.

Key findings:

- Earning a strong college GPA and completing more credits in the first year of college were the strongest overall predictors of postsecondary credential completion.
- After controlling for demographic characteristics and college enrollment and academic factors, earning a strong high school GPA, earning dual-enrollment credits, and taking a college entrance exam before leaving high school were significant predictors of postsecondary credential completion.
- Women were more likely to graduate than men, a finding observed across all models.
- In general, students with higher levels of socioeconomic status were more likely to earn a credential.
- Significant racial differences in completion were present across most models.

- Delaying enrollment into college as well as enrolling in an out-of-state community college significantly lowered the probability of earning a postsecondary credential. Enrolling part-time was also associated with a lower likelihood of credential attainment.
- The direct-from-high school students who participated in extracurricular activities when first enrolled were more likely to graduate.
- The frequency with which students met with an academic advisor was not associated with significant changes in the probability of earning a credential.

In light of key findings, this study concludes with seven overarching recommendations for policymakers and education leaders to consider in order to improve community college completion rates:

1. Ensure students receive a high quality education prior to college.
2. Reduce inequity in school funding and outcomes.
3. Consider new academic and student support models to increase community college student success.
4. Continue strengthening the institutional research capacity at community colleges.
5. Adequately fund community colleges.
6. Strengthen the Pell Grant program and expand need-based aid.
7. Address systemic issues facing society through public policy.

As an increasing number of jobs require education beyond high school, a postsecondary credential remains one of the best investments individuals can make to secure their personal and economic futures. Policymakers, education leaders, and researchers must work cooperatively to increase equitable educational opportunities and improve student outcomes by identifying areas in need of innovation, piloting and evaluating interventions, and implementing data-informed policies and practices.

II. The Research Study

The Research Study

Now more than ever, a college education is vital for economic independence and upward mobility. According to Georgetown's Center on Education and the Workforce, 99 percent of all jobs created since the Great Recession have gone to those with education beyond the high school level (Carnevale, Jayasundera, and Gulish 2016). As the economy continues to recover and diversify, it is clear that more and more individuals will need education and training beyond the high school level.

Community colleges, with their open access and low-tuition missions, are and will continue to be vitally important in helping individuals achieve their education goals and meeting the labor-market needs of our nation. Currently, 45 percent of all undergraduates enrolled in higher education in the U.S. are enrolled in a community college (AACC 2017). These institutions ensure millions of students each year have a viable path towards earning a certificate, associate degree, and/or a bachelor's degree.

This brief is the second in a series of four, exploring outcomes for recent high school graduates who began their postsecondary education in a community college. In the first brief, my co-author and I examined key factors that predict the likelihood of upward transfer for community college students. The goal of this brief is to explore the relationships between demographic characteristics, pre-college academic preparation, college aspirations and plans, and postsecondary experiences and postsecondary credential completion. Drawing from the results

of a series of probit regression models and previous research, this brief concludes with recommendations for policy and practice.

Previous Research

Research on community college student success is both a large and growing area of work for educational researchers. Over the years, a number of studies have explored the relationship between student and institution-level characteristics and a variety of student outcomes. What follows is a brief summary of key points from some of the most relevant literature on community college student success presented as context for this research brief. It is by no means an exhaustive review.

Across the literature, researchers tend to find that women earn college credentials at higher rates than men (Bailey, Jenkins, and Leinbach 2005; Bailey and Weininger 2002; Calcagno, Crosta, Bailey, and Jenkins 2006; Goldrick-Rab 2007; Leinbach and Jenkins 2008; Porchea, Allen, Robbins, and Phelps 2010; Zeidenberg, Jenkins, and Calcagno 2007). In addition to gender differences, significant differences by race and ethnicity are often found with underrepresented minorities succeeding at lower rates than white students (Calcagno et al. 2006; Leinbach and Jenkins 2008; Porchea et al. 2010; Roksa and Calcagno 2008; Zeidenberg et al. 2007). However, researchers have often found race to be difficult if not impossible to disentangle from socioeconomic status (Goldrick-Rab 2007). Still, much of the research suggests students from low-income backgrounds as well as first-generation students tend to face additional challenges and consequently persist at lower rates (Bowen, Kurzweil, and Tobin 2006; Leinbach and Jenkins 2008; Porchea et al. 2010; Roksa and Calcagno 2008).

While demographic characteristics cannot be overlooked, academic preparation while in high school plays a critical role in later college success, particularly for recent high school graduates (Adleman 1999, 2006; Bailey 2004; Calcagno et al. 2007; Dougherty and Kienzl 2006; Warburton, Bugarin, and Nuñez 2001). Adleman (1999, 2006) comprehensively analyzed transcript data from high school seniors in the 1980s and 1990s, finding successful completion of upper-level courses in math, science, and foreign language as well as Advanced Placement (AP) courses to be the greatest predictors of college graduation. While a number of studies have found taking AP/International Baccalaureate courses to be associated with higher rates of success, other research suggests that the greatest impact appears to be on students who pass AP exams (Dougherty, Mellor, and Jian 2006; Geiser and Santelices 2004; Klopfenstein and Thomas 2009). While AP may lead to improved student outcomes, the availability of AP courses still remains highly stratified.

Gagnon and Mattingly (2015) found only around 50 percent of rural school districts offered AP courses, compared to 80 percent of suburban districts, and 97 percent of urban districts. Furthermore, students in more affluent and better resourced school districts tend to have greater levels of success in AP courses than their peers in lower resourced schools. Dual enrollment courses have also been found to have a positive impact on persistence, credit accumulation, and GPA for community and four-year college students (An 2013; Community College Research Center 2012; Grubb, Scott, and Good 2017).

The influence of educational aspirations and college plans on completion have also been explored. Research has largely shown educational aspirations or goals to be relatively poor predictors of degree completion (Aldeman 2005, 2006). This may be in part due to the fact that students, across the board, tend to report very high educational aspirations (Goldrick-Rab 2007). While most high school seniors may anticipate attending college and earning a degree, many are not equipped with the necessary knowledge of how to navigate the complex college application, admissions, and enrollment processes (Deil-Amen and Rosenbaum 2003; Person, Rosenbaum, and Deil-Amen 2006). This is often the case for low-income, first-generation, and underrepresented minority students. Furthermore, research has indicated that when recent high school graduates delay entry into college they are typically less likely to earn a degree (Adleman 2006; Bozick and DeLuca 2005).

Researchers have also explored how student experiences, placement, and academic performance influence student success and degree completion. Maintaining full-time enrollment has been found to significantly increase the likelihood of graduating (Cabrera, La Nasa, and Burkum 2001; Crosta 2014; Ishitani and McKitrick 2010; Martinez 2011). In conjunction with full-time enrollment, completing between 20 and 30 credits within the first year of enrollment is a significant predictor of degree completion (Adleman 2006; Calcagno, Crosta, Bailey, and Jenkins 2006; Davidson and Blankenship 2017; Martinez 2011). While research on enrollment in developmental courses and degree completion has often found a negative relationship, recent research suggests limited evidence for a causal link between developmental courses and persistence (Attewell, Lavin, Domina, and Levy 2006; Bettinger and Long 2009; Hodara and Jaggars 2014; Moss and Yeaton 2006). Financial aid also plays a vital role in promoting student success (Castleman and Long 2013; Chen and DesJardins 2008; Gross 2011; Gross, Torres, and Zerquera 2013; Long 2008; Nora, Barlow, and Crisp 2006). Bettinger (2004) found Pell Grants to be an important tool in boosting student retention and persistence in the first two years of college.

Finally, the study of college student persistence largely suggests that students who feel more academically and socially integrated into the college environment are less likely to drop or stop out (Tinto 1975, 1987, 1993). However, many of the traditional models explaining college student retention and persistence are based on the experiences of students at four-year institutions and are not necessarily applicable to the community college setting. Recognizing this significant gap in the literature, Deil-Amen (2011) suggested that Tinto's concepts of academic and social integration should not be separated for community college students as these students rely more on the academic integration, which then leads to opportunities to interact socially. These "socio-academic integrative moments" include opportunities for community college students to form study groups, participate in learning communities, or engage in group academic advising sessions and are important in fostering community college student persistence (Deil-Amen 2011).

The Study

The goal of this research brief was to identify key predictors of credential completion for students who begin postsecondary education in a community college soon after high school. For the purposes of this brief, community colleges were defined as any public college that offered an associate degree as its highest award. The outcome variable in this study—postsecondary credential completion—measured whether or not the student earned a credit-based sub-baccalaureate certificate, associate degree, or bachelor's degree by 2014. To identify key predictors of credential completion, a series of research-informed demographic, pre-college academic, student aspirational, and postsecondary enrollment and academic characteristics were evaluated using probit regression modeling. The results of the probit regression models, presented as marginal effects, show how each independent or predictor variable impacts the probability of earning a postsecondary credential.

Data for this study come from the Education Longitudinal Study (ELS) of 2002, a nationally representative, longitudinal study of students who began 10th grade in 2002. Data were collected through a series of administrative sources and surveys administered to study participants over a 10-year period. A product of the U.S. Department of Education's National Center for Education Statistics, ELS provides researchers with an extensive body of data on students' high school records, family demographic and background information, postsecondary enrollment and achievement information, and workforce participation. The ELS data are the most recent, fully-completed nationally representative data source following students transitioning from high school to postsecondary education. While the ELS data

are robust, because the sample is derived from high school students who are tracked to postsecondary education and beyond, the data are not representative of all community college students. As a result, the findings of this study are likely confined to traditionally aged students whose first postsecondary institution was a community college. A full discussion of the methods and data used in this study is presented in the appendix.

III. Study Findings

Study Findings

Table 1 presents the results of the study. A total of five probit regression models were estimated to explore how the impact of various independent variables on credential completion changed, as additional variables were considered in the model. Five blocks of independent variables were considered: 1) student demographic characteristics, 2) pre-college academic preparation metrics, 3) college aspirations and plans, 4) early postsecondary enrollment decisions, and 5) academic and non-academic experiences at the students' first postsecondary institution. Located in the appendix, Table A1 provides variable definitions and Table A2 presents the descriptive statistics for all variables analyzed in each model.

Table 1. Results

	Model 1°	Model 2° °	Model 3° °	Model 4° °	Model 5°
	Marginal Probability Effect	Marginal Probability Effect	Marginal Probability Effect	Marginal Probability Effect	Marginal Probability Effect
Female	0.120***	0.068**	0.067**	0.055*	0.078**
	(0.018)	(0.022)	(0.022)	(0.022)	(0.028)
African American	-0.136***	-0.028	-0.033	-0.040	0.007
	(0.026)	(0.035)	(0.035)	(0.037)	(0.047)
Asian/Pacific Islander	0.069*	0.068+	0.062+	0.053	0.061
	(0.032)	(0.036)	(0.036)	(0.037)	(0.045)

Hispanic	-0.115***	-0.090**	-0.083**	-0.088**	-0.024
	(0.024)	(0.029)	(0.029)	(0.030)	(0.040)
Other/Multiple Races	-0.111**	-0.061	-0.057	-0.067	0.025
	(0.038)	(0.047)	(0.047)	(0.047)	(0.066)
Socioeconomic Status	0.073***	0.051**	0.040*	0.050**	0.034
	(0.015)	(0.017)	(0.018)	(0.018)	(0.023)
Dual Enrollment		0.082**	0.076**	0.049+	0.088*
		(0.029)	(0.029)	(0.030)	(0.037)
AP Exam (3 or Better)		0.048	0.038	0.024	-0.011
		(0.061)	(0.059)	(0.059)	(0.069)
Algebra II		0.042+	0.012	0.007	0.034
		(0.025)	(0.026)	(0.027)	(0.033)
HS GPA		0.253***	0.233***	0.222***	0.062*
		(0.020)	(0.020)	(0.021)	(0.027)
Entrance Exam			0.092***	0.075**	0.060*
			(0.023)	(0.024)	(0.030)
Ed. Expectations (< 4 year degree)			-0.087	-0.117+	-0.178*
			(0.067)	(0.069)	(0.086)
Ed. Expectations (4 year degree)			-0.039	-0.081	-0.138
			(0.068)	(0.071)	(0.090)
Ed. Expectations (graduate degree)			-0.041	-0.082	-0.144
			(0.069)	(0.071)	(0.089)
Ed. Expectations (don't know)			-0.094	-0.120	-0.123
			(0.070)	(0.071)	(0.095)
Delayed Enrollment				-0.132***	-0.105**
				(0.025)	(0.035)
Out of State Enrollment				-0.046	-0.153**
				(0.047)	(0.055)
Developmental Education				-0.002	-0.000
				(0.005)	(0.006)
Received a Pell Grant				0.075**	0.074*
				(0.024)	(0.029)
Academic Advising					0.009
					(0.021)
Extracurricular Activities					0.063*
					(0.029)
Full-Time Enrollment					0.115**
					(0.033)
College GPA					0.266***
					(0.020)

Credits in First Year					0.008***
					(0.002)
Pseudo R2	0.034	0.121	0.128	0.140	0.263
n =	4,130	3,480	3,450	3,420	2,570

Notes:
Robust standard errors in paratheses. Per Institute of Education Science guidelines, all unweighted sample sizes were rounded to the nearest 10.

+p < .10 *p < .-5 **p < .01 ***p < .001

° PSWT weight used in analysis

° ° PSTSCWT weight used in analysis

Model 1

In this model, only basic demographic information was analyzed. The results showed women had a 12 percent greater chance of earning a credential than men. Relative to white students, African American, Hispanic, and students of multiple or other races each were significantly less likely to earn a credential (13.6 percent, 11.5 percent, and 11.1 percent, respectively). However, Asian and Pacific Islander students were nearly 7 percent more likely than white students to complete a credential. Socioeconomic status was also found to be a significant predictor of credential completion. The socioeconomic status variable was a standardized composite metric based on five equally weighted components: father's education, mother's education, family income, father's occupation, and mother's occupation. Here, with each one-point increase in the socioeconomic status metric, the probability of completing a credential increased 7.3 percent.

Model 2

In addition to modeling the impact of basic demographic information on credential completion, Model 2 included four measures of pre-college academic preparation. In this model, around 17 percent of students in the sample had participated in dual-enrollment programs. Students who had dual-enrollment experiences while in high school were 8.2 percent more likely to complete a certificate or degree than students who did not. High school GPA was also a highly significant predictor. With each one-point increase in cumulative high school GPA, the probability of completing a credential increased by 25.3 percent. Students who completed algebra II, pre-calculus, or calculus while in high school were 4.2 percent more likely than students who completed a lower level of math in high school to earn a postsecondary credential. However, this finding was only marginally significant. No statistically significant effect was found for students who passed an AP exam; however, only about 3 percent of students in this sample had passed an AP exam.

As with the Model 1, gender remained a significant predictor, with women having a nearly 7 percent greater chance of earning a credential than men. Hispanic students were 9 percent less likely to complete a credential relative to white students. Asian and Pacific Islander students remained nearly 7 percent more likely than white students to complete a credential, though this finding became only marginally significant. No other statistically significant effects were discovered by race. Finally, socioeconomic status remained a highly significant predictor. With each one-point increase in socioeconomic status, the probability of completing a credential increased by 5.1 percent.

Model 3

In Model 3, variables measuring college expectations and plans were incorporated into the analysis. Around 50 percent of students reported having taken the ACT or SAT college entrance exam before the end of their senior year. Students who had taken the ACT or SAT prior to leaving high school had a 9.2 percent greater chance of earning a postsecondary credential than students who did not. However, no statistically significant effect was found among students' stated educational expectations and credential completion.

As with Model 2, high school GPA remained highly significant and resulted in the largest overall effect. With each one-point increase in high school GPA, the probability of earning a credential increased by more than 23 percent. As with high school GPA, participating in dual-enrollment while in high school also remained a significant predictor. Students with dual-enrollment experiences had a nearly 8 percent greater chance of earning a credential relative to students who did not participate in such programs. Completing math at the algebra II-level or higher as well as passing at least one AP exam were not statistically significant predictors.

As with previous models, gender remained a significant predictor with women again having close to a 7 percent greater chance of earning a credential than men. Hispanic students were 8.3 percent less likely to complete a credential relative to white students. Asian and Pacific Islander students were 6.2 percent more likely to earn a credential, though this finding was only marginally significant. No other statistically significant effects were discovered by race. Socioeconomic status remained a significant predictor, with each one-point increase in socioeconomic status resulting in a 4 percent increase in the probability of earning a certificate or degree.

Model 4

Four additional predictor variables measuring early postsecondary education decisions were included in Model 4. First, students who delayed enrollment into college by three months or more were 13.2 percent less likely to earn a credential than students who enrolled directly after high school. Approximately 30 percent of students in the sample delayed their enrollment by three months or more. Receiving a Pell Grant was also associated with a higher probability of earning a credential. Students who received a Pell Grant were 7.5 percent more likely than students who did not receive a Pell Grant to earn a certificate or degree. However, no statistically significant relationship between enrolling in developmental courses and credential completion was discovered. Furthermore, no statistically significant difference was discovered between students who first enrolled in-state compared to out-of-state.

Students who had taken a college entrance exam while in high school were nearly 8 percent more likely to earn a credential than students who had not. By and large, stated educational expectations while in high school remained statistically insignificant. However, relative to students who reported expecting to earn a high school diploma or less, students who reported expecting to earn a two-year degree were nearly 12 percent less likely to earn a certificate or degree. This finding was only marginally significant.

Two measures of pre-college academic preparation—high school GPA and dual enrollment—remained statistically significant predictors. With each one-point increase in high school GPA, the probability of earning a postsecondary credential increased by 22.2 percent. Furthermore, participating in dual-enrollment programs increased the chances of earning a credential by nearly 5 percent, though this finding was only marginally significant. The level of high school math completed, and passing at least one AP Exam, remained statistically insignificant.

Women had a 5.5 percent greater chance of earning a credential than did men. Hispanic students were nearly 9 percent less likely, relative to white students, to earn a certificate or degree. Finally, with each one-point increase in socioeconomic status, the probability of completing a credential increased by 5 percent.

Model 5

The final model, Model 5, included five additional variables measuring phenomena that occurred at students' first postsecondary institutions or within their first year of college enrollment: GPA at first postsecondary institution, number of college credits earned in the first year, enrollment intensity at the first institution, participation in extracurricular activities, and meetings with an academic advisor.

Unsurprisingly, college GPA was a highly significant and impactful predictor of credential attainment. With each one-point increase in college GPA, the probability of earning a certificate or degree increased nearly 27 percent. Furthermore, earning more credits in the first-year was associated with higher rates of completion. For each college credit earned in the first-year, the probability that students would complete a credential increased by nearly 1 percent. Students who enrolled exclusively full-time at their first institution were also 11.5 percent more likely to earn a credential than students who at any time enrolled part-time. Participating in extracurricular activities while enrolled in a community college was also associated with increased chances of earning a certificate or degree. Students who reported participating in extracurricular actives were 6.3 percent more likely to earn a credential than students who reported no extracurricular participation. However, no statistically significant effect associated with academic advising was discovered.

As with the previous model, students who delayed postsecondary enrollment after high school were nearly 11 percent less likely to earn a certificate or degree. Receiving a Pell Grant was also associated with a 7.4 percent increase in the probability of earning a credential. Enrolling in an out-of-state community college was found to significantly lower the probability of earning a credential. Students who enrolled in an out-of-state community college after high school had a 15.3 percent lower chance of earning a credential than students who remained in-state. No significant impact was discovered for developmental education enrollment.

Educational expectations remained mostly statistically insignificant, though relative to students who expected to earn a high school education or less, students who expected to earn education at the sub-baccalaureate level were significantly less likely to earn a credential. Taking an entrance exam while in high school was still a significant predictor of credential completion. Students who took the ACT or SAT while in high school were 6 percent more likely to complete a credential than students who had not.

Of the pre-college academic preparation factors in Model 5, only high school GPA and participation in dual-enrollment programs remained statistically significant. Each additional point in high school GPA was found to increase the probability of earning a credential by 6.2 percent. Participating in dual-enrollment programs resulted in close to a 9 percent increase in the chances of earning a certificate or degree.

Finally, the demographic controls included in this final model largely became statistically insignificant. While no statistically significant racial or socioeconomic differences were discovered, significant gender differences were still present. In the final model, women were still nearly 8 percent more likely to complete a postsecondary credential relative to men.

Summary

The results of the five models yielded a number of interesting findings. Eight of the most salient findings are presented below:

1. Earning a strong college GPA and completing more credits in the first year of college were the strongest overall predictors of postsecondary credential completion.

2. After controlling for demographic characteristics and college enrollment and academic factors, earning a strong high school GPA, earning dual-enrollment credits, and taking a college entrance exam before leaving high school were significant predictors of postsecondary credential completion.

3. Women were more likely to graduate than men, a finding observed across all models.

4. In general, students with higher levels of socioeconomic status were more likely to earn a credential.

5. Significant racial differences in completion were present across most models.

6. Delaying enrollment into college as well as enrolling in an out-of-state community college significantly lowered the probability of earning a postsecondary credential. Enrolling part-time was also associated with a lower likelihood of credential attainment.

7. The direct-from-high school students who participated in extracurricular activities when first enrolled were more likely to graduate.

8. The frequency with which students met with an academic advisor was not associated with significant changes in the probability of earning a credential.

IV. Recommendations

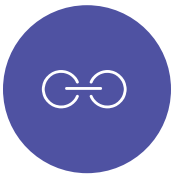
Recommendations

The findings from this study have important implications for policy and practice. Informed by these findings and previous research, I offer seven overarching recommendations for policymakers and practitioners to consider in order to increase credential completion rates for community college students. A brief list of additional resources is presented at the end of this section for those interested in learning more about efforts to increase community college completion rates.

Ensure students receive a high quality education prior to college.

Preparing students to be "college ready" starts in elementary school with teachers and administrators helping students understand what college is, as well as helping students explore future careers, and equipping them with a sense of what is achievable through education. At the high school level, teachers and administrators must continue to nurture career exploration and educational aspirations. Furthermore, high school seniors should be encouraged not to delay enrollment in college, as longer gaps between high school and college enrollment are associated with significantly lower chances of credential completion. Academically, high school students need access to rigorous curricula that include opportunities to earn college credits in high school, particularly through dual-enrollment opportunities.

Developing strong academic skills in high school will lessen the chances students will require developmental education in college and prepare them with skills necessary to succeed in college-level instruction and ultimately complete a certificate or a degree.



Reduce inequity in school funding and outcomes.

Policymakers have an enormous role to play in ensuring school districts have the resources to provide high quality education for students. Research continues to show that spending per student varies widely within and across states. Underrepresented minority students and students from low socioeconomic backgrounds—those that stand to benefit the most from high quality elementary and secondary education—are often overrepresented in school districts with the lowest per-student expenditures and limited educational opportunities. State policymakers need and must do more to eliminate resource disparities among schools to ensure all students have an equal opportunity to achieve their educational goals. The federal government must do more to encourage states to reduce inequity in school funding and should prioritize the allocation of federal dollars to schools with the highest percentages of children from low-income and disadvantaged backgrounds. Proposals to reduce funding to high-poverty schools by eliminating or redistributing funds from Title I should be reconsidered. Greater funding for Title I along with funding for rigorous causal research into what works to improve educational outcomes will be necessary to overcome historic and systemic inequity in our nation's education system.

Consider new academic and student support models to increase community college student success.

Community colleges provide access to higher education for millions of students each year. Increasing completion rates is an important task, one that community colleges are actively working towards accomplishing. A growing body of research and program evaluation is helping to identify innovations shown to increase completion rates. For example, the guided pathways model is a comprehensive

framework that encourages institutions to adjust their practices and policies to help students more quickly select a program of study and more clearly understand the steps required in meeting their educational goals. The guided pathways model calls on colleges to reexamine their program structure, new student advising, instruction, and student support services.

Another promising innovation, the Accelerated Study in Associate Programs (ASAP) pioneered by the City University of New York (CUNY), supports students pursuing an associate degree by providing a wide range of financial, academic, and personal support services. Some of the central tenets of ASAP are the requirements that students maintain continuous full-time enrollment and regularly engage in comprehensive and personalized academic and career advising sessions. In addition, students are provided tuition waivers to meet any unmet need after financial aid, provided with textbook vouchers, and transit cards, as well as opportunities to take classes with other ASAP students in convenient blocks of time friendly to work schedules. The ASAP is a comprehensive program that focuses on helping students become more academically and socially integrated within the college environment. Early evaluations of CUNY's ASAP program have shown it to be very successful in increasing the graduation rates of low-income students with developmental education needs.

Both ASAP and the guided pathways model recognize the need for multifaceted approaches to increase community college completion rates. Rethinking academic advising, making student support services more robust, reducing the costs to students of education, reconsidering developmental education models, and helping students become more integrated into the college environment by recognizing both their unique experiences and the demands they face are all important. Included in the additional resources section of this brief are reports discussing some promising practices at community colleges across the country, including CUNY's ASAP and the guided pathways approaches.

Continue strengthening the institutional research capacity at community colleges.

In addition to implementing new and promising practices to improve completion rates, community colleges will need to consider expanding the institutional research capacity of their institutions beyond what is required for federal, state,

and accreditation-based accountability purposes. Institutional research can play a pivotal role in helping colleges assess the effectiveness of their curricula, academic and student support services, as well as to track the progress of newly implemented success initiatives. Community college executives will need to work with faculty and administrators in order to create and maintain a data-informed culture. Initiatives such as Achieving the Dream provide a multitude of resources to college leaders interested in growing a "culture of evidence"—one that collects and uses data to implement meaningful change—at their institution.

Adequately fund community colleges.

Community colleges have shown they are eager to consider new ways of helping more students meet their educational goals. State policymakers will need to ensure that these institutions are adequately funded to take on the important task of increasing completion rates. The open access mission of community colleges means they serve students of all academic backgrounds, including those in the greatest need of additional support. They must do all of this while keeping tuition low, putting a strain on their limited resources. State and federal policymakers should consider increasing institutional improvement grants for colleges, particularly those that serve large numbers of disadvantaged students. These grants can help support colleges pilot new student success programs as well as to build out the institutional research capacity needed to assess program effectiveness on their campuses.

Strengthen the Pell Grant program and expand need-based aid.

Federal policymakers must fully support the Pell Grant program. Pell Grants help millions of low-income and first-generation students access and complete higher education each year. Federal policymakers should establish the Pell Grant program as an entitlement. This would provide stable annual funding for the program, rather

than subjecting aid amounts to the annual appropriations process. Furthermore, increases to the maximum Pell Grant award should, at minimum, track with inflation and ideally grow to cover a larger proportion of the total average cost of attendance. If the program is not made an entitlement, efforts to remove funds from the Pell Grant program surplus rather than reinvesting the dollars in strengthening the program are counterproductive and represent a step in the wrong direction. Finally, federal and state policymakers should consider allocating additional resources to expand need-based grant aid for students. These additional dollars would help low-income and first-generation students cover a larger proportion of the total cost of attendance at many colleges and universities without the use of loans.

Address systemic issues facing society through public policy.

Policymakers must not forget that students face a number of barriers to success. While schools and colleges can help eliminate or reduce barriers to attainment, many are beyond their control to influence directly. For example, providing a low-income college student with aid to pay for tuition is important, but can only be so effective if the student cannot afford a safe place to live or healthy and nutritious food to eat. The systemic issues of poverty, racism, housing and food insecurity, and unequal access to quality and affordable healthcare cannot be ignored. Policymakers must adequately fund existing and future social and economic programs aimed at eliminating the root causes of poverty and inequality.

Conclusion

The value of a college credential is continuing to grow. As an increasing number of jobs require education beyond high school, a postsecondary credential remains one of the best investments individuals can make to secure their personal and economic futures. Community colleges are and will continue to be at the forefront of ensuring students have access to the benefits of a college education. Policymakers, education leaders, and researchers must work cooperatively to increase equitable educational opportunities and improve student outcomes by identifying areas in need of innovation, piloting and evaluating interventions, and implementing data-informed policies and practices.

V. Additional Resources

Additional Resources

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VII. Appendix: Methods

Appendix: Methods

Data for this study came from the Education Longitudinal Study of 2002 (ELS), a nationally representative study of 10th grade students in 2002. The sample was generated by randomly selecting 10th grade students from more than 700 randomly selected high schools across the United States, generating an initial sample of approximately 16,200 students. In addition to the original baseline data collected in 2002, data were collected in 2004, 2006, 2012, and postsecondary transcript data were collected in 2014. While it is important to note that these data are not a representative sample of community college students, ELS provides the most recent and complete data for researchers interested in exploring the connections between high school and other pre-college factors and postsecondary persistence and degree completion.

The population of interest in this study was students who enrolled in a community college directly after high school. Community colleges were defined as any public college that offered an associate degree as its highest award. The initial sample was created by first identifying and removing the 4,570 students without a postsecondary transcript record. Next, the sample was restricted to students whose first postsecondary institution was a community college. A student's first institution was defined in such a way to exclude dual enrollment institutions or institutions students were enrolled in while still in high school. This yielded a sample of 4,160 students.

Community colleges serve students who seek to complete a variety of educational goals. While some students enroll for the purposes of earning an associate

degree, others enroll to earn a certificate, or to complete some lower-division coursework prior to transfer to a four-year institution. The outcome variable in this study—postsecondary credential completion—was constructed by examining postsecondary transcript records to identify any student who had earned a credit-based sub-baccalaureate certificate, associate degree, or bachelor's degree by 2014. Students may have earned a credential at their starting institution or a subsequent institution. Drawing from previous research literature, I constructed a list of variables with which to test their influence on credential attainment. Table A1 provides a description of the dependent variable and all independent variables evaluated in this study. Table A2 provides summary statistics of all variables for each model.

Because the outcome variable was categorical, probit regression analysis was used to explore the relationships between the independent variables and the probability of earning a postsecondary credential. Probit analysis relies on the probit link—the inverse of the cumulative distribution function of the standard normal distribution—to transform probabilities to the standard normal variable. Conceptually, the probit regression equation is represented by:

$$\Phi^{-1}(\pi_i) = \beta_0 + \chi_i' \beta_i + \varepsilon_i$$

Where Φ^{-1} is the probit link function, represented by:

$$\Phi(z) = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}t^2} dt.$$

Because of the probit link function, estimation results are interpreted as a one unit change in χ_i results in β_i change in the z-score of the outcome $\Phi^{-1}(\pi_i)$ or the probability of the outcome occurring. However, changes in z-score are hardly accessible effects to interpret. Rather, the results of probit regression are often presented in terms of marginal effects. Marginal effects are the change in probability as a function of a change in an explanatory variable, holding other explanatory variables constant. The results presented in Table 1 were all converted to marginal probability effects. The probit regression coefficients are presented in Table A3.

A total of five probit regression models were presented in the findings section of this brief. To accommodate the complex survey design of ELS, appropriate sampling weights were incorporated into the estimation of all probit models. The first model estimated included a block of student demographic characteristics. With each additional model estimated, a new block of related variables was added

to the analysis without removing any previously included variables. This process allows the reader to witness (1) the changing significance of factors when additional controls were incorporated into the models and (2) changes to the pseudo R^2 value, a rough estimate of overall model fit. However, it is also worth noting that the sample size of the models varied, as students who had missing information on any of the included variables were excluded from that specific model.

Finally, it is important to remember that the results of the models suggest correlation between factors and postsecondary credential completion and do not necessarily imply the existence of causal relationships. Additional experimental and quasi-experimental studies will be needed in order to more accurately isolate the causal effects particular factors have on credential attainment.

Table A1: Variable Definitions

Variable	Definition
Credential Attainment	1 = Student earned a sub-baccalureate certificate, associate degree, or bachelor's degree at any institution by 2014.
	0 = Student did not earn a sub-baccalureate certificate, associate degree, or bachelor's degree at any institution by 2014.
Sex	1 = Female
	0 = Male
African American	1 = African American
	0 = Not African American
Asian/Pacific Islander	1 = Asian/Pacific Islander
	0 = Not Asian/Pacific Islander
Hispanic	1 = Hispanic
	0 = Not Hispanic
Other/Multiple Races	1 = Other/Multiple Races (Including American Indian)
	0 = Not Other/Multiple Races
White*	1 = White
	0 = Not White
Socioeconomic Status	A standardized composite measure of students' families' socioeconomic status. This composite metric is based on five equally weighted components: father's education, mother's education, family income, father's occupation, and mother's occupation.
Dual Enrollment	1 = Student took at least one college-level course offered by a postsecondary institution before leaving high school.
	0 = Student enrolled in no college-level courses offered by a postsecondary institution before leaving high school.
AP Exam (3 or Better)	1 = Student earned a score of 3 or higher on any Advanced Placement exam.
	0 = Student earned a score of 1 or 2 on any Advanced Placement exam or did not take any Advanced Placement exams.

Algebra II	1 = Student completed at least a half-year of algebra II, trigonometry, pre-calculus, or calculus in high school
	0 = Student's highest level of math completed in high school was geometry, algebra I, pre-algebra, general or consumer math, or other math
HS GPA	Cumulative grade point average earned for all courses in grades 9-12 on a four-point scale.
Entrance Exam	1 = Student reported having taken a college entrance exam (SAT or ACT) before leaving high school.
	0 = Student reported having not taken a college entrance exam (SAT or ACT) before leaving high school.
Ed. Expectations (high school or less)*	1 = In their senior year, student reported expecting to complete no education above the high school level
	0 = All other expectations
Ed. Expectations (< 4 year degree)	1 = In their senior year, student reported expecting their highest level of education to be some college or a two-year degree
	0 = All other expectations
Ed. Expectations (4 year degree)	1= In their senior year, student reported expecting their highest level of education to be a four-year degree.
	0 = All other expectations
Ed. Expectations (graduate degree)	1 = In their senior year, student reported expecting their highest level of education to be a graduate degree.
	0 = All other expectations
Ed. Expectations (don't know)	1 = In their senior year, student reported being unsure about their educational expectations.
	0 = All other expectations
Delayed Enrollment	1 = Student enrolled in college more than three months after leaving high school.
	0 = Student enrolled in college within three months of leaving high school.
Out of State Enrollment	1 = Student enrolled in a community college located in a different state than their high school.
	0 = Student enrolled in a community college located in the same state than their high school.
Developmental Education	The total number of postsecondary developmental education courses enrolled in by the student.
Received a Pell Grant	1 = Student received a Pell Grant.
	0 = Student did not receive a Pell Grant.
Academic Advising	0 = At first postsecondary institution, student reported never meeting with an academic advisor.
	1 = At first postsecondary institution, student reported sometimes meeting with an academic advisor.
	2 = At first postsecondary institution, student reported frequently meeting with an academic advisor.
Extracurricular Activities	1 = Student reported participating in extracurricular activities at their first postsecondary institution.
	0 = Student did not report participating in extracurricular activities at their first postsecondary institution.

Full-Time Enrollment	1 = Student maintained full-time enrollment status while at their first postsecondary institution.
	0 = Student was enrolled part-time for at least one term while at their first postsecondary institution.
College GPA	Cumulative grade point average earned for all courses taken at first postsecondary institution.
Credits in First Year	Cumulative number of college-level credits earned during the first year of postsecondary enrollment after high school.

* Denotes variables which served as the reference group in the probit regression analyses

Table A2. Descriptive Statistics

	Model 1°	Model 2° °	Model 3° °	Model 4° °	Model 5°
	Mean	Mean	Mean	Mean	Mean
	(SD)	(SD)	(SD)	(SD)	(SD)
Credential Attainment	0.400	0.413	0.413	0.414	0.475
	(0.490)	(0.492)	(0.492)	(0.493)	(0.499)
Female	0.517	0.519	0.519	0.521	0.535
	(0.500)	(0.500)	(0.500)	(0.500)	(0.499)
African American	0.138	0.132	0.133	0.134	0.118
	(0.345)	(0.339)	(0.340)	(0.341)	(0.323)
Asian/Pacific Islander	0.041	0.043	0.043	0.042	0.048
	(0.199)	(0.202)	(0.203)	(0.202)	(0.214)
Hispanic	0.202	0.205	0.205	0.204	0.184
	(0.401)	(0.404)	(0.404)	(0.403)	(0.388)
Other/Multiple Races	0.046	0.043	0.043	0.044	0.037
	(0.211)	(0.204)	(0.203)	(0.204)	(0.189)
Socioeconomic Status	-0.114	-0.105	-0.107	-0.106	-0.072
	(0.657)	(0.657)	(0.656)	(0.656)	(0.655)
Dual Enrollment		0.172	0.172	0.170	0.209
		(0.378)	(0.377)	(0.376)	(0.406)
AP Exam (3 or Better)		0.030	0.030	0.030	0.035
		(0.171)	(0.172)	(0.170)	(0.185)
Algebra II		0.698	0.700	0.702	0.740
		(0.459)	(0.458)	(0.457)	(0.439)
HS GPA		2.587	2.587	2.591	2.705
		(0.675)	(0.676)	(0.671)	(0.647)
Entrance Exam			0.510	0.511	0.573
			(0.500)	(0.500)	(0.495)
Ed. Expectations (< 4 year degree)			0.253	0.253	0.236
			(0.435)	(0.435)	(0.425)
Ed. Expectations (4 year degree)			0.360	0.362	0.390
			(0.480)	(0.481)	(0.488)
Ed. Expectations (graduate degree)			0.260	0.259	0.277
			(0.439)	(0.438)	(0.447)
Ed. Expectations (don't know)			0.086	0.086	0.073
			(0.280)	(0.281)	(0.260)
Delayed Enrollment				0.302	0.188
				(0.459)	(0.390)

Out of State Enrollment				0.071	0.049
				(0.256)	(0.215)
Developmental Education				2.025	2.123
				(2.584)	(2.673)
Received a Pell Grant				0.538	0.524
				(0.499)	(0.500)
Academic Advising					0.962
					(0.659)
Extracurricular Activities					0.335
					(0.472)
Full-Time Enrollment					0.749
					(0.433)
College GPA					2.460
					(0.947)
Credits in First Year					14.856
					(10.744)
n =	4,130	3,480	3,450	3,420	2,570

Notes:
Per Institute of Education Sciences guidelines, unweighted sample sizes were rounded to the nearest 10.

° PSWT weight used in analysis

° ° PSTSCWT weight used in analysis

Table A3: Probit Coefficients

	Model 1°	Model 2° °	Model 3° °	Model 4° °	Model 5°
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Female	0.313***	0.175**	0.173**	0.142*	0.198**
	(0.049)	(0.060)	(0.057)	(0.058)	(0.071)
African American	-0.372***	-0.073	-0.087	-0.105	0.016
	(0.075)	(0.091)	(0.092)	(0.097)	(0.118)
Asian/Pacific Islander	0.175*	0.173+	0.159+	0.135	0.154
	(0.081)	(0.091)	(0.092)	(0.093)	(0.112)
Hispanic	-0.309***	-0.237**	-0.220**	-0.233**	-0.060
	(0.068)	(0.079)	(0.080)	(0.081)	(0.100)
Other/Multiple Races	-0.303**	-0.161	-0.150	-0.178	0.063
	(0.111)	(0.126)	(0.127)	(0.129)	(0.165)
Socioeconomic Status	0.189***	0.132**	0.104*	0.130**	0.086
	(0.039)	(0.045)	(0.046)	(0.048)	(0.058)
Dual Enrollment		0.209**	0.195**	0.125+	0.223*
		(0.072)	(0.074)	(0.076)	(0.094)
AP Exam (3 or Better)		0.124	0.097	0.063	-0.027
		(0.154)	(0.150)	(0.150)	(0.175)
Algebra II		0.110+	0.032	0.017	0.086
		(0.066)	(0.068)	(0.070)	(0.085)
HS GPA		0.654***	0.602***	0.574***	0.156*
		(0.051)	(0.052)	(0.054)	(0.069)
Entrance Exam			0.238***	0.195***	0.153*
			(0.061)	(0.063)	(0.077)
Ed. Expectations (< 4 year degree)			-0.229	-0.312+	-0.463*
			(0.180)	(0.189)	(0.235)
Ed. Expectations (4 year degree)			-0.101	-0.212	-0.353
			(0.178)	(0.187)	(0.232)
Ed. Expectations (graduate degree)			-0.107	-0.217	-0.369
			(0.182)	(0.191)	(0.236)
Ed. Expectations (don't know)			-0.251	-0.325	-0.321
			(0.196)	(0.206)	(0.260)
Delayed Enrollment				-0.351***	-0.270**
				(0.069)	(0.093)
Out of State Enrollment				-0.122	-0.406**
				(0.126)	(0.156)
Developmental Education				-0.004	-0.000
				(0.012)	(0.015)
Received a Pell Grant				0.195**	0.186*
				(0.062)	(0.074)

Academic Advising					0.023
					(0.053)
Extracurricular Activities					0.160*
					(0.072)
Full-Time Enrollment					0.295**
					(0.085)
College GPA					0.672***
					(0.051)
Credits in First Year					0.019***
					(0.004)
Constant	-0.283***	-2.075***	-1.866***	-1.617***	-2.728***
	(0.042)	(0.051)	(0.214)	(0.233)	(0.295)
Pseudo R^2	0.034	0.121	0.128	0.140	0.263
n =	4,130	3,480	3,450	3,420	2,570

Notes:

Robust standard errors in parentheses . Per Institute of Education Sciences guidelines, unweighted sample sizes were rounded to the nearest 10.

+p < .10 *p < .05 **p < .01 ***p < .001

° PSWT weight used in analysis

° ° PSTSCWT weight used in analysis

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