Prepared by
Abt Associates
for Success Boston

The Power of Coaching

Interim Report on the Impact of Success Boston's Transition Coaching on College Success

Success Boston
COLLEGE COMPLETION INITIATIVE

About Success Boston

Success Boston is Boston's citywide college completion initiative. Together, the Boston Foundation, the Boston Public Schools (BPS), the City of Boston, the Boston Private Industry Council, 37 area institutions of higher education, led by UMass Boston and Bunker Hill Community College, and local nonprofit partners are working to double the college completion rate for students from the BPS. Success Boston was launched in 2008 in response to a longitudinal study by Northeastern University's Center for Labor Market Studies, which showed that only 35% of those BPS graduates who had enrolled in college ever completed a postsecondary certificate, Associate's or Bachelor's degree within seven years of graduation from high school. Together, the partner organizations implemented a three part strategy: getting ready, getting in, and getting through—to ensure Boston's young people are prepared to meet the challenges of higher education and achieve a degree that will allow them to thrive in the workplace. Recently, Success Boston has expanded its mission to include "getting connected" to the labor market upon graduation from college. In 2014, the Boston Foundation received a grant from the Corporation for National and Community Service to expand this effort. This $6 million Social Innovation Fund award gives the Foundation the resources necessary to expand Success Boston's transition coaching model from serving 300 to 1,000 students from each of the Boston Public Schools classes of 2015, 2016 and 2017.

About Abt Associates

Founded in Cambridge, Massachusetts in 1965, Abt provides applied research and consulting services to government agencies, philanthropic, nonprofit, and commercial organizations around the world. Abt's mission is to improve the quality of life and economic well-being of people worldwide. It applies its exceptional subject matter expertise, outstanding technical capabilities in applied research, and strategic planning to help local, national and international clients make better decisions and deliver better services.

Success Boston Coaching (SBC)

Interim Outcomes Report

Final Draft

March 23, 2017

Prepared for:
Elizabeth Pauley
Antoniya Owens
Eric Esteves
John Griffin
The Boston Foundation
75 Arlington Street, 10th Floor
Boston, MA 02116

Written by:
Tamara Linkow
Beth Gamse
Fatih Unlu
Erin Bumgarner
Hayley Didriksen
Jane Furey
Michael Meneses
Mona Sami
Austin Nichols
Abt Associates
55 Wheeler Street
Cambridge, MA 02138

Acknowledgements

The Success Boston Study Team would like to thank the students, coaches, non-profit organizational leaders and staff, higher education partners and staff, and the Boston Foundation staff. Their many contributions to the study are deeply appreciated. We are the beneficiaries of their generosity of time and spirit, which were instrumental in the preparation of this report.

List of Exhibits

Executive Summary

Today, earning a college degree is seen as crucial for future well-being. College graduates earn more, are less likely to suffer job losses in a recession, and are projected to have superior long-term labor market prospects (U.S. Census Bureau 2014). Nationally, more than three of ten jobs already require postsecondary education (BLS 2017) and more than six of ten current jobs are filled by candidates with postsecondary education (Carnevale, Smith, and Strohl 2013a). These figures reflect the competitive advantage of postsecondary education: even when a job does not explicitly require a degree, a candidate with a degree will tend to be hired over an equally qualified candidate without one. By 2020, over 70 percent of Massachusetts jobs are projected to be filled by workers with postsecondary credentials (Carnevale, Smith, and Strohl 2013b), a proportion higher than the state's likely supply of college graduates, creating additional competitive pressure on Massachusetts residents in the labor market. In Boston, the six-year college graduation rate for the city's 2009 public high school graduates who enrolled in college was 51 percent (McLaughlin et al. 2016). This rate improves upon the 39 percent seven-year rate for 2000 graduates, yet is not sufficient to meet the predicted demand for a college-educated workforce.[1]

Students from low-income backgrounds and racial/ethnic minority groups may fail to enroll in, persist in, and graduate from college because of social, academic, and logistical barriers. Specifically, students face limited support both socially and academically (Arnold et al. 2009; Roderick et al. 2008; Scott-Clayton 2011), and they may also be unfamiliar with how to manage key deadlines (Castleman and Page 2015; Avery and Kane 2004).

One strategy proven effective in helping students meet these challenges is one-on-one coaching from experienced counselors (Arnold et al. 2009; Castleman, Arnold, and Wartman 2012; Bettinger and Baker 2014; Castleman, Page, and Schooley 2014; Avery, Howell, and Page 2014; Carrell and Sacerdote 2013; Scrivener and Weiss 2009; Sum et al. 2013; Stephan and Rosenbaum 2013). Such coaching

Success Boston Coaching: 2013-14 and 2014-15

- During the years covered in this study, seven local nonprofit organizations provided one-on-one coaching to students for their first two years in college. The organizations included: American Student Assistance, Boston Private Industry Council, Bottom Line, Freedom House, Hyde Square Task Force, Sociedad Latina, and West End House. Another nonprofit organization, uAspire, provided financial aid assistance, and advising to Success Boston students, as well as training for Success Boston coaches.
- College/university partners included: Benjamin Franklin Institute of Technology, Bridgewater State University, Bunker Hill Community College, Massachusetts Bay Community College, Northeastern University, Roxbury Community College, Salem State University, Suffolk University, and University of Massachusetts Boston
- Prior research found that more coached students persisted in college than non-coached students (Sum et al. 2013).

[1] A 2008 report, *Getting to the Finish Line: College Enrollment and Graduation, A Seven-year Postsecondary Longitudinal Study of the Boston Public Schools Class of 2000 Graduates*, found that 64% of nearly 3,000 BPS Class of 2000 graduates enrolled in a postsecondary institution within the first seven years of high school graduation, yet only 35.5% of college enrollees had earned a certificate, a two-year degree, or a four-year degree (Sum et al. 2008). That figure was later revised to 39%.

can start as early as students' senior year of high school and continue through their first two years in college.

The connection between college completion and future economic stability—at individual, family, and community levels—is at the heart of an ambitious city-wide collaboration. In 2008, the Success Boston initiative began with the goal of improving college completion rates of Boston public high school graduates, many of whom are members of groups traditionally underrepresented in college degree attainment. Higher college graduation rates, in turn, are expected to increase these students' access to employment in local industries requiring advanced training, such as technology, financial services, higher education, and medical sectors.

The Success Boston initiative represents a major partnership among the Boston Foundation (TBF), City of Boston, Boston Public Schools (BPS), University of Massachusetts Boston, Bunker Hill Community College, other regional colleges and universities, uAspire, the Boston Private Industry Council, and other local nonprofit organizations. Success Boston strategies include academic programming and college advising activities at the high school level; one-on-one coaching support for students transitioning into and through the first two years of college; and close collaboration with local higher education institutions to track BPS graduates, to help them earn degrees, and to prepare them for successful entry into the workforce.

The Boston Foundation is the convening backbone organization of the Success Boston initiative. In particular, the foundation provides funding and other resources to the nonprofit organizations engaged in one of the core programs within the overall initiative: one-on-one *transition coaching*, hereafter known as Success Boston Coaching (SBC).

Selected study findings

SBC coached students are **11% more likely** than non-coached peers to persist into the second year of college, and **21% more likely** to persist into the third year [a] of college than non-coached students.

College GPA of SBC coached students is **8% higher** than that for non-coached students.

Coached students are **9% more likely** to renew their FAFSA than non-coached students.

[a] Third-year persistence rates are based on the 2013 BPS graduates only.

Precisely these kinds of "transitional supports" can increase college persistence (Arnold et al. 2009; Bettinger et al. 2012; Bettinger and Baker 2014; Carrell and Sacerdote 2013; Castleman, Arnold, and Wartman 2012; Castleman, Page, and Schooley 2014; Stephan and Rosenbaum 2013). Evidence from Boston specifically indicates the potential for SBC to boost college graduation rates for BPS graduates: The Center for Labor Market Studies at Northeastern University evaluated the effect of SBC on college persistence at seven participating colleges

and found that the one-year persistence rate for SBC students was 20.4 percentage points higher than that of non-SBC college students (Sum et al. 2013).

A recent descriptive report, focused on college completion rates for the BPS graduating class of 2009, compares SBC

participants with all non-participating BPS graduates; this report finds some potentially promising results for SBC. Comparing coached and non-coached students who initially enrolled in two-year colleges, 35 percent of SBC students and 23.8 percent of non-participating students completed within six years. The overall completion rates for Black Success Boston coached students—who represented over one-third (35.6 percent) of SBC students—were higher than the completion rates of students who did not participate in coaching through Success Boston: 53.2 percent versus 40.6 percent (McLaughlin et al. 2016).

TBF contracted with Abt Associates to design and conduct a longitudinal evaluation of the SBC program, reflecting its commitment to continued learning and ongoing program improvement. Focusing on the classes of 2013 and 2014, the seven-year study examines both the implementation and impact of SBC (from fall 2013 through spring 2020).

The evaluation is designed to answer three main research questions:

1. What is the effect of SBC—above and beyond the services students already receive—on early outcomes, such as persistence, academic achievement, Free Application for Federal Student Aid (FAFSA) renewal, and ultimately, on postsecondary completion?

2. How do the seven nonprofit organizations implement SBC (i.e., in terms of amount of time spent coaching, caseload, method of delivery, type of coach, coach tenure, recruitment/assignment procedures, etc.)? How do the coaching models vary across nonprofit organizations?

3. How do student outcomes vary in SBC, and are certain features of the coaching or characteristics of participating students associated with particular outcomes?

This report, the second of three reports to be released over the course of the evaluation, focuses on the effectiveness of coaching on key student outcomes, answering the first and third research questions. The report focuses on the classes of 2013 and 2014. The second research question is addressed in an earlier implementation-focused report, *Degrees of Coaching: Success Boston's Transition Coaching Model* (Linkow et al. 2015).

For this interim outcomes report, the study collected data from BPS, the Massachusetts Department of Elementary and Secondary Education (MA DESE), and nine partner colleges. The report assesses whether and how transition coaching delivered through SBC by the seven nonprofit coaching organizations affects students' short-term college outcomes. It examines impacts for two specific cohorts of students: those who graduated from BPS in 2013 and 2014, or who have been out of high school for three and two years, respectively, and would have entered college in the fall of 2013 and 2014. Using a rigorous quasi-experimental design, the report compares outcomes for the group of students who participated in SBC to those of a group of similar students who did not. As such, it provides *causal* evidence that observed differences in outcomes between the two groups are due to participation in Success Boston coaching. Based on what we learned, several themes have emerged.

The analyses estimate that SBC students (the "treatment group" in the evaluation) have better early college outcomes than do their carefully matched peers not participating in SBC ("comparison group"). Specifically, SBC students are:

- more likely to persist into their *second* year of college (83 percent for SBC students in the treatment group vs. 75 percent for the non-coached students in the comparison group)
- more likely to persist into their *third* year of college (75 percent vs. 62 percent)
- enrolled for more continuous semesters (average of 3.43 semesters vs. 3.24 semesters)
- maintaining higher cumulative grade point averages (2.45 vs. 2.26)
- more likely to be in good academic standing at their college (78 percent vs. 71 percent)
- accumulating more college credits (of the credits necessary to graduate at their college, 39 percent completed vs. 36 percent)
- more likely to complete FAFSA renewals for their second year of college (85 percent vs. 78 percent).

Exploratory analyses estimate that, generally, coaching is particularly impactful for students who experience more-frequent and longer coach interactions. Specifically, SBC students who experience 10 or more coaching interactions, more interactions on any of the topic areas addressed, and longer coach-student interactions (i.e., 27 or more minutes) have more positive college outcomes than those of their peers not participating in SBC.

The results also suggest that greater exposure to some specific coaching features strengthens the impacts of SBC; in other words, the impacts are stronger for students who have experienced more interactions, as well as interactions that cover certain topics. Specifically, students who had:

- experienced more coach-student interactions had higher rates of persistence into the third year of college and more semesters in good academic standing than did students who had experienced fewer interactions
- more exposure to academic topics during coaching interactions spent more semesters in good academic standing
- more exposure to financial aid topics during coaching interactions were more likely than students with less exposure to financial aid topics to persist into the second and third years, to have higher cumulative grade point averages, and to spend more semesters in good academic standing
- more exposure to career topics during coaching interactions were more likely to persist into the second year, to have higher cumulative grade point averages, and to have spent more semesters in good academic standing.

The study's final report, scheduled for release in December 2020, will track the same two cohorts of students for six years after their college entrance to examine whether the positive impacts on early outcomes found here—which are predictive of college completion (Bettinger and Baker 2014; Scrivener and Weiss 2009; Stephan and Rosenbaum 2013)—do in fact result in more students completing a college degree or credential.

1. Introduction

The Success Boston initiative is a city-wide collaborative of the Boston Foundation (TBF), City of Boston, Boston Public Schools (BPS), University of Massachusetts Boston, Bunker Hill Community College, other regional colleges and universities, uAspire, the Boston Private Industry Council, and other local nonprofit organizations. The partners focus is on boosting college persistence and ultimately improving college completion rates for Boston's public school graduates through a purposeful combination of program, policy, and practice-based activities. Success Boston prioritizes low-income, first-generation students of color, focusing on helping students *get ready* for college academically, socially, and emotionally, *get in* to college, and *get connected* to a career upon college graduation.

A key goal of Success Boston is to ensure that 70 percent of 2011 BPS graduates who enroll in postsecondary education earn a credential within six years of high school graduation. To reach this goal, the initiative provides academic programming and college advising activities at the high school level; supports students as they transition into college through one-on-one coaching into the first two years of college; and works closely with Boston area higher education institutions to track their data on BPS graduates and to help students earn a degree and be prepared to enter the workforce.

The Boston Foundation is the convening backbone organization of the Success Boston initiative. In particular, the foundation provides funding and other resources to nonprofit organizations engaged in a central program of the initiative: one-on-one *transition coaching* provided to students during their first two years in college, hereafter known as the Success Boston Coaching (SBC) program.

1.1 About Success Boston Coaching (SBC)

Launched in 2009, SBC focuses purposefully on easing the transition from high school to college, and ultimately, increasing college completion. It does so by working with nonprofit organizations that provide the coaching as well as with partner colleges, which communicate with coaches and help coordinate coaching services on their campuses. SBC also works through the SBC network, which facilitates communication across organizations and provides coaches access to training sessions designed specifically for the initiative, including trainings on financial aid from a national nonprofit organization, uAspire. TBF oversees the coaching network.

In 2013-2014 and 2014-15, the Boston Foundation funded seven nonprofit organizations to coach more than 750 first- and second-year students enrolled in more than 30 Boston area colleges.

In academic year 2014-15, seven nonprofit coaching organizations provided coaching through Success Boston: American Student Assistance, Boston Private Industry Council (PIC), Bottom Line, Freedom House, Hyde Square Task Force, Sociedad Latina, and West End House. SBC allowed these organizations, which already had existing programs for BPS students, to expand their programming to more students and to extend services into college. Success Boston coaches from these organizations worked with BPS students to prepare them to become independent college students able to navigate their way to college graduation. They did so through providing support on life skills, study skills, help-seeking skills, and academic skills; they helped students develop meaningful relationships, clarify goals, access networks, understand college culture, and make college life feasible; and they provided job and career mentoring. In addition, throughout the

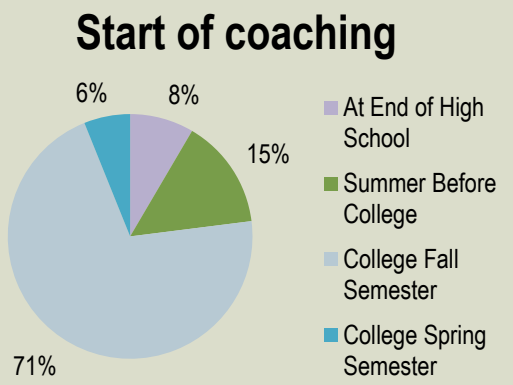
academic year uAspire, a national non-profit organization focused on increasing knowledge and resources to make college affordable, provided SBC students with direct support on filling out financial aid forms.

To recruit students into SBC, these seven nonprofit coaching organizations use multiple strategies, including referrals from high school guidance counselors and other community organizations; nonprofit organizations' middle school and high school programming pipelines; word of mouth; and outreach on college campuses. Students report that they learn about SBC through presentations from the nonprofit organizations at their high school, as well as conversations with individuals ranging from a nonprofit coach, an afterschool or summer program staff member, a high school or college staff person, or a friend or neighborhood acquaintance. The local area colleges and universities also refer students to the nonprofit organizations.

Not surprisingly, the use of such varied strategies, occurring at different points in time, means that students are recruited to participate in SBC as early as the end of high school, after high school graduation and through the summer before college enrollment, and even into the first fall semester of college. It also means that each cohort entering college in the fall of a given year includes students with different relationships to nonprofit organizations, motivation to attend college, and predispositions to reach out for support. Once students are recruited, the coaching activities typically start during the first fall semester of college.

Recruitment of college-intending students can begin as early as the end of high school and continues through the first semester of college.

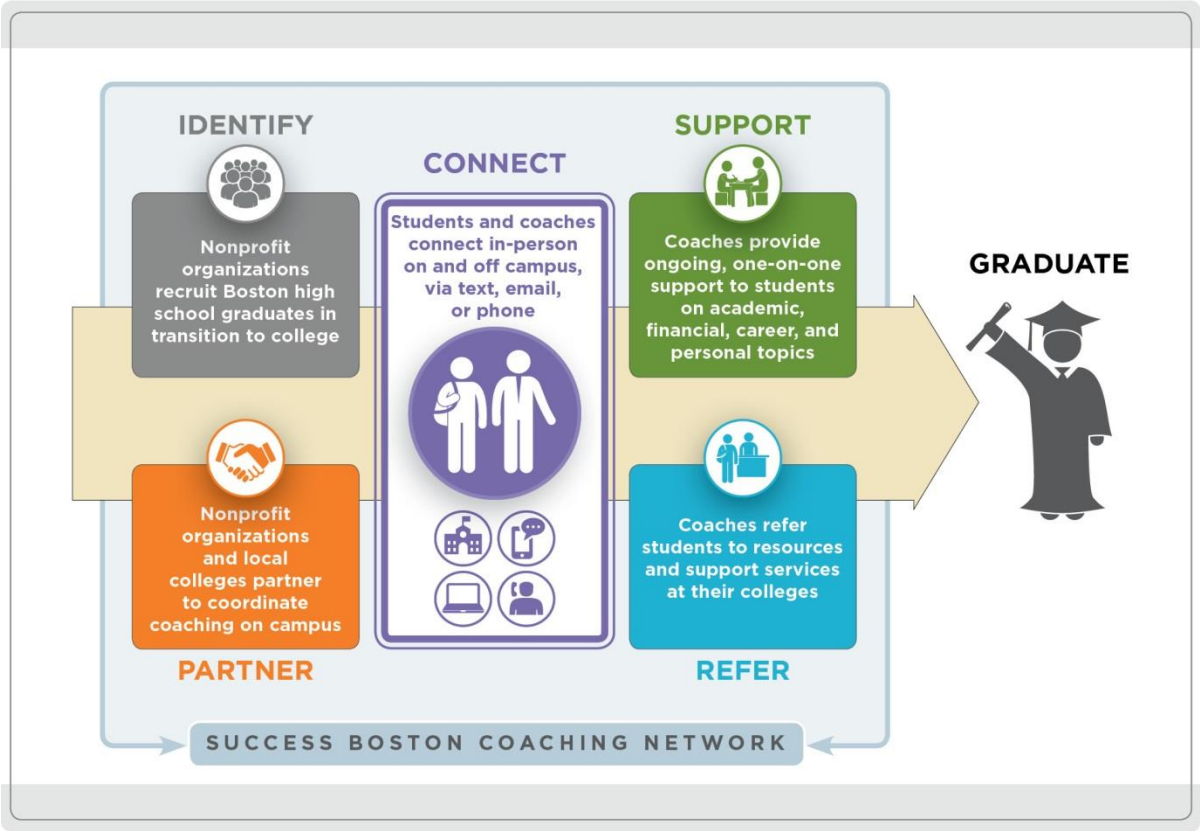
Coaching activities then begin for most students (92 percent) after high school graduation.



Source: Success Boston program data, 2014-15

Exhibit 1-1 displays how the organizations, partner colleges, and the Success Boston network collaborate to provide transition coaching to support students on the path to college graduation. Each nonprofit organization ***identifies*** and recruits Boston public high school graduates through the various means described above to participate in the SBC transition coaching program. Local colleges ***partner*** with the nonprofits and coaches to coordinate coaching activities on their campuses. Once students are confirmed as coaching participants, coaches ***connect*** with them through multiple modes—in-person or via text, email, or phone—to help students navigate the college-going process. Through one-on-one meetings, coaches provide ongoing ***support*** to students across a range of topics and ***refer*** students to supports on their campuses.

Exhibit 1-1: Success Boston Coaching model



Coaches support students when needed throughout the academic year, offering on-demand guidance to students to help them stay on track toward graduation.[2] The SBC network, overseen by TBF, facilitates communication across organizations; it also provides coaches access to to specialized training about financial aid from uAspire, a national nonprofit organization, as well as access to training on other topics.

Since the start of SBC in 2009, eight cohorts of Boston public high school graduates have received coaching.[3] An earlier evaluation demonstrated that coaching substantially increased student persistence in college for students from the BPS graduating class of 2009 (Sum et al. 2014).

More recently, a follow-up analysis of the BPS class of 2009, which compares SBC and all non-SBC BPS graduates, finds some potentially promising results. Coached and non-coached students who initially enrolled in four-year colleges generally completed college at similar rates of about 60 percent, consistent with the 62 percent national six-year completion rate for the 2009 cohort (Shapiro

[2] For a detailed description of how SBC was implemented in the 2014-15 academic year, see the report *Degrees of Coaching: Success Boston's Transition Coaching Model* (Linkow et al. 2015) available here: http://www.tbf.org/tbf/55/success-boston/research-and-press.

[3] The two latest cohorts, college entrants in fall 2015 and fall 2016, participate in an expansion of Success Boston Coaching called Boston Coaching for Completion (BosC4C). Implementation of BosC4C is examined in the 2015-16 Implementation Report (Linkow et al. 2017).

et al. 2015). However, the six-year graduation rates for students who enrolled in two-year colleges favor SBC students: 35 percent of SBC students versus 23.8 percent of non-participating students completed within six years (McLaughlin et al. 2016).

The overall completion rates for Black Success Boston coached students—who represented over one-third (35.6 percent) of SBC students—were higher than the completion rates of students who did not participate in coaching through Success Boston: 53.2 versus 40.6 percent (McLaughlin et al. 2016).

1.2 Evaluation Research Questions

Given earlier evidence and TBF's continued investment in BPS students' postsecondary success, TBF contracted with Abt Associates in 2014 to conduct a comprehensive evaluation of the transition coaching program.

This report extends the findings of Sum and colleagues (2013 and 2014); it includes additional cohorts of students (classes of 2013 and 2014) and expands to include several additional outcomes: annual postsecondary enrollment and persistence rates, annual academic achievement, and ultimately, postsecondary certification and degree completion. Further, the evaluation includes an implementation component that examines consistency and variation in coaching among the participating organizations (see Linkow et al 2015); this information can also be used to explore relationships between implementation and student outcomes.

In particular, the evaluation is designed to answer three main research questions about SBC's implementation and impact:

1. What is the effect of SBC—above and beyond the services students already receive—on early outcomes such as persistence, academic achievement, Free Application for Federal Student Aid (FAFSA) renewal, and ultimately, on postsecondary completion?

2. How do the seven nonprofit organizations implement SBC (i.e., in terms of amount of time spent coaching, caseload, method of delivery, type of coach, coach tenure, recruitment/assignment procedures, etc.)? How do the coaching models vary across nonprofit organizations?

3. How do student outcomes vary in SBC, and are certain features of the coaching or characteristics of participating students associated with particular outcomes?

1.3 About This Report

Findings from these research questions are included in three separate reports. The first report, produced in November 2015, focused on Research Question 2 to examine how nonprofit partner organizations implemented coaching for 2013 and 2014 high school graduates (Linkow et al. 2015). The last report, due out in 2020, will explore long-term outcomes and variation in impacts as of the 2019-20 academic year (Research Questions 1 and 3).

This second of the three reports:

- focuses on early program impacts (as of fall of the 2015-16 academic year) on student outcomes (Research Question 1), as well as on how program impacts vary by certain student characteristics and features of coaching (Research Question 3)
- explores impacts for the high school graduating classes of 2013 and 2014, who have been out of high school for three and two years, respectively
- uses a quasi-experimental design (matched comparison group) to form as strong a counterfactual as possible: similar students who did not receive the SBC intervention.

Before we turn to study specifics, we summarize relevant literature about what we might expect to learn about the impact of transition coaching (Chapter 2). Next, we review the study's design, analysis approach, data sources, and measures. Chapter 4 summarizes the impact analyses separately for each student outcome, including persistence, achievement, and financial aid. For each outcome, we describe the average or overall impact, as well as whether and how effects vary by student characteristics. Chapter 5 examines how the impacts of SBC are related to features of the coaching itself. The report concludes with a discussion and recommendations (Chapter 6).

2. Improving College Enrollment and Completion

Today, earning a college degree is seen as crucial for future well-being. College graduates earn more, are less likely to suffer job losses in a recession, and are projected to have superior long-term labor market prospects (U.S. Census Bureau 2014). Nationally, more than three of ten jobs already require postsecondary education (BLS 2017) and more than six of ten current jobs are filled by candidates with postsecondary education (Carnevale, Smith, and Strohl 2013a). These figures reflect the competitive advantage of postsecondary education: even when a job does not explicitly require a degree, a candidate with a degree will tend to be hired over an equally qualified candidate without one. By 2020, over 70 percent of Massachusetts jobs are projected to be filled by workers with postsecondary credentials (Carnevale, Smith, and Strohl 2013b), a proportion higher than the state's likely supply of college graduates, creating additional competitive pressure on Massachusetts residents in the labor market. In Boston, the six-year college graduation rate for the city's 2009 public high school graduates who enrolled in college was 51 percent (McLaughlin et al. 2016). This rate improves upon the 39 percent seven-year rate for 2000 graduates, yet is not sufficient to meet the predicted demand for a college-educated workforce. [4]

Despite an overall increase both nationally and locally in college-going rates in recent decades, students from low-income backgrounds and racial/ethnic minority groups are less likely to attend, persist, and complete college than their peers (e.g., U.S. Department of Education 2016; Haskins 2008; Bailey and Dynarski 2011). Low-income students, in particular, along with first-generation college students, ethnic minorities, and males have all been found to be underrepresented in postsecondary education (Arnold et al. 2009; Arnold, Lu, and Armstrong 2012; Harper 2006; Harper and Griffen 2011; Tym et al. 2004). In the early 2000s, across the income distribution, only 29 percent of those from the lowest income quartile attended a postsecondary institution compared with 80 percent of those from the top income quartile (Bailey and Dynarski 2011). College completion rates among low-income students paint an even bleaker picture: only 9 percent of youth from the lowest income quartile attain a college degree, compared with 54 percent of those from the top income quartile.

Success Boston's recent *Reaching for the Cap and Gown* report highlights similar trends for Boston; college access and success cut along both racial/ethnic and gender lines among Boston high school graduates; Boston's White and Asian students were more likely than their Black and Hispanic peers to enroll in college and to earn a college credential, and its female students across all racial groups were more likely to graduate from college than male students (McLaughlin et al. 2016).

In today's knowledge-based economy, disparities in college enrollment and completion rates for male students, students of color, and low-income students place them at a distinct disadvantage in the workforce because college education can serve as a key gateway to the middle class for low-income students (e.g., Ayala and Striplen 2002; Haskins 2008; Pfeffer and Hertel 2015). In Boston, the

[4] A 2008 report, *Getting to the Finish Line: College Enrollment and Graduation, A Seven-year Postsecondary Longitudinal Study of the Boston Public Schools Class of 2000 Graduates*, found that 64% of nearly 3,000 BPS Class of 2000 graduates enrolled in a postsecondary institution within the first seven years of high school graduation, yet only 35.5% of college enrollees had earned a certificate, a two-year degree, or a four-year degree (Sum et al. 2008). That figure was later revised to 39%.

education gap has consequential effects on median annual earnings: adults 25 years of age and older with a Bachelor's degree earn, on average, $54,768—nearly twice what high school graduates earn (U.S. Census Bureau 2014). A college degree represents an opportunity for socioeconomic mobility; when children born into the lowest 20 percent of the income distribution receive a college degree, their chances of escaping the bottom tier increase by more than 50 percent (Isaacs, Sawhill, and Haskins 2008), reflecting the well-documented significant and positive returns to a Bachelor's degree on income (Aud et al. 2012; Carnevale, Rose, and Cheah 2011), as well as on social and health-based outcomes (Baum, Ma, and Payea 2013; Hout 2012; Meara, Richards, and Cutler 2008).

Low college attendance and completion rates among students from low-income backgrounds and racial/ethnic minority groups are attributed in part to informational and support gaps for these students once they enroll and attend college (Arnold et al. 2009; Avery and Kane 2004; Avery, Howell, and Page 2014; Bozick and DeLuca 2011, Roderick et al. 2008). Gaps in services can affect college-intending students immediately following their graduation from high school, when they do not have access to high school services. In a phenomenon called "summer melt," low-income college-intending high school graduates fail to matriculate to the college of their choice during the summer following their senior year of high school (Arnold et al. 2009; Castleman, Arnold, and Wartman 2012; Castleman, Page, and Schooley 2014; Cooper et al. 1996; Hossler and Gallagher 1987). Summer melt has been attributed to several factors. These include students' difficulty making sense of financial aid packages; determining how (and where from) to find funds to bridge the gap between available financial aid and the cost of college; and completing the numerous time-sensitive administrative tasks, such as course registration and FAFSA completion (Arnold et al. 2009; Castleman, Arnold, and Wartman 2012; Castleman and Page 2015; Castleman, Page, and Schooley 2014).

Students from groups traditionally underrepresented in college, in particular, may lack access to professional guidance on understanding the financial aid process and options (Arnold et al. 2009; Bettinger et al. 2012; Roderick et al. 2008;) or to prompts that remind them to meet unfamiliar deadlines (Hoxby and Turner 2013; Ross et al. 2013). They may also require additional social-emotional supports during their transition to college. Students may struggle socially and emotionally with the adjustment to college—particularly around whether they belong in college—which, in turn, has been found to influence students' overall college engagement, achievement, and adjustment to college (Walton and Cohen 2011).

Further, too many first-generation college students enter higher education underprepared for college-level academic demands, which can affect their capacity to persist and complete college degrees (Greene and Winters 2005). A 2013 study that examined the relationship between academic advising and retention of first-generation college students found that academic advising can consistently and effectively connect these students to academic resources on campus. In fact, this analysis found that the odds of a first-generation college student remaining enrolled at a given college increased 13 percent for every meeting with an advisor (Swecker, Fifolt, and Searby 2013).

Moreover, though college advisor systems have been found to be beneficial for students in need of academic remediation (Bahr 2008; Swecker, Fifolt, and Searby 2013;), academic advisors may have limited time to provide the level of support students need, particularly students attending two-year and four-year public institutions. A survey of college academic advisors found that the median caseload of a full-time academic advisor is 441 advisees at public community colleges and 260

advisees at public four-year colleges (Carlstrom and Miller 2013). A separate study, based on a national survey of college counseling center directors, found that the counselor to advisees ratio is 1 to 1,500 for 55 percent of community colleges (Gallagher 2010).

Transition coaching is a promising intervention to help students manage the financial, administrative, and academic obstacles they may face; in such coaching, designated coaches work with high school graduates as they enter and adjust to college. In particular, SBC aims to bridge the gap for students who may not have sufficient resources and supports during the transition from high school to college.

2.1 How Coaching Can Address Challenges First-Generation and Low-Income Students of Color Face Transitioning to College

Transition coaches can help students assess how they can reduce the gap between the cost of college and what they can afford. One qualitative study examined why students who enrolled in college failed to actually attend; researchers learned that many students believed college was too expensive and did not know how to acquire additional aid to pay for it (Arnold et al. 2009). Direct supports from coaches may offer a means to address students' misconceptions or gaps in knowledge about college financial aid, help students complete lengthy and complex financial aid forms, and remind students of key due dates. For example, Bettinger et al. (2012) found that personal assistance, combined with information about financial aid, substantially increased FAFSA submissions and ultimately the likelihood of college attendance, persistence, and aid receipt.

Students from low-income backgrounds and racial/ethnic minority groups are more likely to be first-generation college students (NCES 2012) whose parents and peers are unfamiliar with the academic, financial, and social-emotional challenges students can face when entering college (Castleman and Page 2013; Stephens et al. 2015). As a result, students may lack support from their families as they deal with stress related to the social and academic demands of college. Coaching programs represent a promising solution for students who lack access to information, guidance, and general support from their familial and social networks (Avery and Kane 2004; Bettinger et al. 2013; Deming and Dynarski 2009; Roderick et al. 2008).

Students who are new to college may also experience a range of academic challenges, including unanticipated course difficulty, uncertainty about how to select the appropriate courses to meet college major and degree completion requirements, and managing time allocation across classes. Coaching can help students make informed course and internship choices based on their own skills, interests, and career goals; it can also help students struggling to stay on task in their courses through identifying additional supports that can promote persistence and graduation (Castleman and Page 2015; Bettinger and Baker 2014; Bettinger, Boatman, and Long 2013; Karp 2011; Johnson and Rochkind 2009; Oreopoulos and Petronijevic 2016).

2.2 Research on Impact of Transition Coaching

Recent rigorous research on transition coaching examines the summer between students' senior year of high school and freshman year of college. Although SBC coaching services generally begin during the fall of students' first college year, the similarities between SBC and summer-based coaching activities suggest meaningful insights on the potential effects of coaching. Several recent studies, including randomized control trials, viewed as the gold standard in social policy research, find that

coaching interventions significantly increase students' college matriculation and persistence. They provide particularly strong evidence regarding the impact of coaching on students' college outcomes.

- In a study of the Beacon Mentoring Program at South Texas College, students in mathematics classes were randomly assigned either to no mentor or to a mentor who encouraged then to use tutoring and other campus services and who offered one-on-one support if needed. The program increased students' use of the campus tutoring center and reduced the likelihood that they would withdraw from the course (Visher, Butcher and Cerna 2010).
- A small-scale pilot study examined outcomes for students in urban Big Picture high schools who were randomly assigned either to receive systematic outreach and assistance from transition coaches over the summer or to a business-as-usual condition. Coached students' enrollment in four-year colleges was 14 percentage points higher than control group enrollment rates, corresponding to a 1.5 times higher likelihood of program students keeping their postsecondary plans (Arnold et al. 2009; Castleman, Arnold, and Wartman 2012). However, as Castleman and colleagues cautioned, the unique features of Big Picture schools, including individualized attention students receive from coaches, may mean that these findings do not generalize to other coaching interventions in urban high schools.
- The Big Picture schools pilot study design was subsequently replicated under different conditions: students in two districts, Boston, Massachusetts, and Fulton County, Georgia, were randomly assigned to summer outreach and coaching. Coaching increased college enrollment among program students in both districts. In particular, coaching increased the probability of college enrollment by 3 percentage points, leading to a 20-percent reduction in summer melt. The impacts of coaching were more pronounced for Boston students and for low-income students in both sites (with increased probabilities of between 8 and 12 percentage points). In addition, the study found that summer counseling led to increased rates at which students persisted in college through their sophomore year (Castleman, Page, and Schooley 2014).
- Another study examined the effect of Inside Track, which provides one-on-one coaching targeting students currently attending college. Inside Track coaches regularly contact their students to provide help and support as the students start their college careers and continue through their first year of college. Freshman students attending eight different postsecondary institutions, including two- and four-year schools, who were randomly assigned to receive targeted coaching were 15 percent more likely to have persisted in college 18 to 24 months later than those who did not receive the coaching (Bettinger and Baker 2014).
- A study of the Opening Doors program randomly assigned students either to a regular college counselor or to a program counselor. Program students were expected to meet with their Opening Doors counselor at least twice each semester for two semesters to discuss academic progress and resolve any issues that might affect their schooling. Each program counselor worked with far fewer students than did the regular college counselors, which allowed for more frequent, intensive contact. The program improved academic outcomes during students' second semester in the study; however, the program did not significantly increase the average number of credits that students earned after the program ended or over the study's three-year follow-up period (Scrivener and Weiss 2009).

- A study of a peer coaching program at the University of Toronto randomly assigned first-year students to upper-year undergraduate coaches. The peer coaches met regularly with students to provide one-on-one support (either in person or via Skype) on a variety of college-related topics. Students who received coaching had significantly higher average grades and overall grade point averages (GPAs): approximately a 5 percentage point increase in average course grades and a 0.35 standard deviation increase in GPA) versus students who did not receive coaching (Oreopoulos and Petronijevic 2016).

Though impacts on student outcomes for these studies are generally positive, the magnitude of the impacts and the outcomes on which impacts are detected varies. Castleman, Page, and Schooley (2014) attribute differences in impact to several factors related to the intervention itself, including differences in the rates of student communication with advisors; amount of attention each student received from his/her counselor; and prior experience coaches had with supporting students' college enrollment tasks. Two additional factors—differences in student access to other supports and differences in percentage of low-income students in each sample—may also have played a role in the variation in magnitude of impacts across the studies cited above.

2.3 Research on Success Boston Coaching (SBC)

Prior research focused specifically on SBC provides promising evidence of the benefits to coaching. In 2014, the Center for Labor Market Studies (CLMS) at Northeastern University used a matched comparison group design to compare outcomes for BPS 2009 graduates who did and did not participate in SBC (Sum et al. 2014). The study found preliminary evidence of a positive and statistically significant effect on college persistence. SBC students had higher one-, two-, three-, and four-year college persistence rates than did their non-coached peers, with estimated effects of 17.3 percentage points in the first year, 17.9 percentage points in the second year, 15.2 percentage points in the third year, and 12 percentage points in the fourth year. Though SBC students outperformed each of their comparison group counterparts, persistence rate impacts varied slightly by gender and ethnicity, and impacts were generally greater for Black students. Specifically, Black students had higher persistence rates than their Hispanic peers (58 percent versus 46 percent) and their comparison group counterparts (25 percent versus 13 percent). Sum et al. (2014) conducted analyses that controlled for student demographics, students' 10^{th}-grade Massachusetts State Assessment System (MCAS) English/language arts scores, and the type of colleges they initially attended; they found positive and statistically significant effects on college outcomes for BPS 2009 graduates as of 2013 (Sum et al. 2014).

Success Boston's 2016 *Reaching for the Cap and Gown* report provides a descriptive examination of college enrollment and completion for participants in SBC for the BPS class of 2009, comparing them with non-participating students. The report found that the coached and non-coached students who initially enrolled in four-year colleges generally completed college at similar rates of about 60 percent, quite similar to the national six-year completion rate of 62 percent for students entering college in fall 2009 (Shapiro et al. 2015). Success Boston–coached students have an edge when they attend two-year colleges, however: 35 percent of Success Boston students and 24 percent of non-participating students completed a degree or credential within six years. The *Reaching for the Cap and Gown* report also examined outcomes at the seven top-enrolling colleges and universities (as had Sum and colleagues in their 2013 and 2014reports), and found that nearly half (49 percent) of SBC students at these colleges completed a degree, compared with 38.5 percent of non-coached students.

Further, the overall completion rates for Black Success Boston coached students—who represented over one-third (35.6 percent) of SBC students—were higher than the completion rates of students who did not participate in coaching through Success Boston: 53.2 percent versus 40.6 percent (McLaughlin et al. 2016).

The current study builds on the 2014 CLMS study described above. It uses a more rigorous design that matches students more systematically, uses more extensive baseline characteristics in the matching process, and includes not just one but several cohorts of students. The evaluation also examines additional student outcomes, including academic achievement, FAFSA renewal, and college graduation rates; it also investigates how differences in key programmatic features affect student outcomes. Chapter 3 describes the study design in greater detail.

3. Evaluation Design

In this chapter, we begin with an overview and then describe the evaluation design in more detail. The chapter outlines the quasi-experimental approach we used to estimate program impacts, beginning with the study's data sources. Then it describes the study sample—both the program students (those who participated in Success Boston Coaching, called the "treatment group") and the non-coached matched students who comprise the comparison group. Next, the chapter describes our approach to exploratory analysis—that is, how we examine the relationship between *impacts* on program students and *variation* in impacts according to student and coach characteristics. The chapter then summarizes the data sources and the outcomes used in the the study. It concludes by reviewing the measures created to assess program impacts, as well as measures of student characteristics and features of coaching used to explore how program impacts vary according to those characteristics and features ("moderators").

Key Design Features

This study employs the strongest design possible to support causal claims about the effects of Success Boston Coaching on students. The design:

- Follows students who graduated from Boston and Boston-area public high schools in 2013 and 2014 for two and three years, respectively
- Employs a quasi-experimental design where SBC students are matched based on observable characteristics to similar students who did not participate in coaching to create a comparison group of students who are as statistically similar as possible to the treatment students *before* participation in Success Boston Coaching
- Matches based on two features: *local* in that treatment and comparison students are from the similar high school environments and the same college settings, and also *focal* as treatment and comparison students are carefully matched, such that they are equivalent on baseline characteristics believed to predict both selection into the SBC program and outcomes of interest
- Constructs two groups, (one group of treatment and one of comparison students), who are similar on observable characteristics at the beginning of the study, or baseline, to rule out the possibility that baseline characteristics themselves account for any observed differences between SBC and non-coached students
- Uses data from Boston Public Schools, Massachusetts Department of Elementary and Secondary Education, National Student Clearinghouse, colleges in which BPS students enrolled, and the SBC program database
- Measures outcomes across three domains: persistence, achievement, and financial aid. The persistence and achievement domains have multiple outcome measures, characterized either as *primary* or *exploratory* outcomes
- Examines how observed impacts of SBC vary as a function of particular student characteristics or features of coaching, through a set of exploratory analyses.

The remainder of this chapter provides more detail on these design features.

3.1 Study Design

The study uses a quasi-experimental design in which outcomes are compared for students who participated in Success Boston Coaching and students who did not. This report examines impacts for students who graduated from BPS in 2013 and 2014; who have been out of high school for three and two years, respectively; and who entered college in the falls of 2013 and 2014. The study created a comparison group of students who are as similar to the treatment students as possible, using an approach called *local and focal matching*.

It is "local" in that each SBC student is matched with one (and possibly multiple) non-SBC students from the same high school graduating class, from high schools with similar characteristics, and enrolled in the same college; and it is "focal" because students are matched based on similar baseline characteristics (e.g., gender, race/ethnicity, high school academic achievement, socioeconomic status) that are empirically linked both to the outcomes of interest and also potentially to receipt of SBC coaching.

3.1.1 How We Identified Students in the Sample

Students participating in the SBC program (i.e., the treatment group) are identified in the program's administrative database. All students who appear in the database are considered SBC students for purposes of the evaluation. This inclusive definition means that all students who were initially recruited into the SBC program, and therefore appeared in the program database, are eligible to be in the evaluation sample even though some did not have a single recorded interaction with a coach.[5] A total of 808 students are identified as SBC students in the 2013 or 2014 college-entering cohorts. Of these 808 students, 792 SBC students match to existing administrative datasets that include baseline high school characteristics on students (from BPS and MA DESE).

The comparison group is identified from the 25,249 high school graduates in 2013 and 2014 from BPS and 19 surrounding districts. Students from school districts surrounding BPS are identified because all BPS students at one of the partner colleges, UMass Boston, are offered coaching either from a Success Boston nonprofit organization coach or from a college coach, making all BPS students at UMass Boston ineligible for the comparison group.

To be eligible for the evaluation sample, students had to:

- enroll in college in the fall after high school graduation
- enroll in a college in which at least one SBC student and at least one potential comparison student were enrolled in that given year
- have no missing information on key baseline characteristics (free and reduced-price lunch status and high school GPA) used in the matching process.

[5] In the 2014-15 academic year, 12 percent (95 students) of the 2013 and 2014 cohorts had no coaching interactions recorded in the program database.

Exhibit 3-1: Students eligible for inclusion in the sample

	SBC Students	Potential Comparison Students		
		From BPS	From Outside of BPS	Total
High School Graduates (identified in administrative datasets)	792	5,922	19,327	25,249
Ineligible Students				
Did Not Enroll in College in Fall	59	2,797	7,205	10,002
Did Not Enroll in Fall at a College with at least 1 SBC Student and 1 Potential Comparison Student	3	1,461	11,461	12,922
Missing Key Baseline Data	8	23	41	64
Eligible for Matching	722	1,641	620	2,261

After applying the eligibility criteria, there were 722 SBC students and 2,261 non-SBC students who could be included in the evaluation sample. Students included in the evaluation sample were selected through the local and focal matching process referenced above and described in more detail below.

3.1.2 How We Test Program Impacts Using a Matched Comparison Group

Overview of the Matched Comparison Group Design

In social science research, an *experimental* design is considered the gold standard approach for testing program impacts. Experimental designs use random assignment to form groups (often called treatment group and control group) and then compare outcomes for the two groups to test whether the treatment group has different (presumably better) outcomes than the control group. Because the groups are formed by random assignment, they are expected to be statistically equivalent with respect to all relevant characteristics, so that any differences in outcomes can be attributed to the program of interest and not to some other characteristic(s) that might have influenced both participation in the program and outcomes (e.g., various dimensions of academic or non-academic achievement levels, including non-cognitive skills).

Because an experimental design was not possible for SBC, given partner organizations' capacity and the size of the potential participant population, we used one of the strongest quasi-experimental designs available—a design that allows us to account for as many of the student background characteristics as possible, to help ensure that the treatment and comparison group students are statistically similar *before* participation in Success Boston Coaching. For example, one potential difference in background characteristics between program participants and non-coached students could be academic readiness for college. Students who participate in Success Boston Coaching do so voluntarily; they may simply be more academically prepared to attend college than students who do not sign up for coaching. Differences such as these (also called "confounders") present an important methodological challenge, because differences in preparation (or other background characteristics) could explain why we might see differences in student outcomes for treatment and comparison group students, rather than participation in the program alone.

We address this methodological challenge by using a quasi-experimental method that both compares SBC students with a comparison group of similar students and that can account for as many of these confounders as possible. Guided by current methodological research on best practices for such studies, we use a specific type of matching process to construct the strongest comparison group

possible (Bifulco 2012; Clair, Cook, and Hallberg 2014; Steiner, Cook, and Shadish 2011).[6] Our approach has two features: matches are *local* (treatment and comparison students are from the same setting, to the extent possible) and also *focal* (treatment and comparison students are carefully matched such that they are equivalent on baseline characteristics believed to predict both selection into the program and outcomes of interest).

For this evaluation, we implemented local and focal matching by (1) defining "matching blocks"—that is, unique combinations of cohorts (2013 or 2014 high school graduation years) and postsecondary institutions; and (2) matching each SBC student with one and possibly multiple non-SBC students in his/her block who share similar baseline characteristics. Further, heeding prior research, these baseline characteristics are both empirically linked to the study's key outcomes and also potentially linked to receipt of SBC coaching.[7] These matching criteria yield a large number of matching characteristics, which we translate into estimated *propensity scores*, or the probability of participating in Success Boston Coaching. We describe the matching process below, and provide additional information on local and focal matching in Appendix A.

Estimation of the Propensity Scores

One of the simplest ways to match treatment and comparison groups would be to form matched pairs with the same baseline characteristics (i.e., exact matching). For example, we could match female students in the treatment group with female students in the comparison group. Though straightforward, this approach becomes infeasible as the number of characteristics used in the matching increases. Instead, we use propensity score matching, because it allows us to account for a diverse set of background characteristics and experiences within a single measure.

More specifically, a *propensity score* is a number that represents the likelihood of receiving the treatment, based on a student's background characteristics and experiences (Rosenbaum and Rubin 1983). For this study, drawing from BPS and MA DESE student-level data (including an exit survey of BPS students), the propensity score represents the likelihood that an individual student participates in SBC, based on the following baseline characteristics:

- **Demographics**: race/ethnicity, gender, free/reduced-price lunch status, disability status, and English language learner (ELL) status
- **High school achievement**: GPA, SAT scores, 10th-grade MCAS scores, and number of advanced courses taken in high school

---

[6] This line of research uses within-study comparisons (also called design replication studies) to inform best quasi-experimental design practices by replacing the randomly determined control group in an experiment with comparison groups constructed from units that did not participate in the original experiment, using different quasi-experimental design methods. These studies compare the impact estimates based on comparison groups constructed by quasi-experimental designs versus the experimental impact estimates and try to generalize the specific features of the quasi-experimental designs that replicate (or come closest) to the experimental results.

[7] The matching blocks for all colleges except UMass Boston included only students from BPS. The blocks for UMass Boston included SBC students from BPS and non-SBC students from nearby districts with similar characteristics to BPS.

- **Characteristics of high schools**: High school college-going rate and high school average MCAS math and English scores
- **Behavioral measures and extracurricular activities in high school**: absenteeism, number of suspensions, number of activities, and holding a paid job in high school
- **Post–high school plans and college aspirations**: Expected education plans after high school, whether the student felt prepared for college, whether the student was contacted by a post–high school organization, and when the student talked with parents about post–high school plans.

For a complete list of student and high school characteristics used in the propensity score model, see Exhibit A-4 in Appendix A.

We selected the specific variables listed above based on a comprehensive literature review and on information from coaching organizations about criteria they use when selecting and/or targeting students for their programs (Exhibit A-2 and Exhibit A-3 in Appendix A summarize key features from the literature review).

Using this set of characteristics, a propensity score was estimated for each student in the matching blocks, including treatment students and potential comparison group students. Propensity scores can range from 0 to 1, with numbers closer to 1 representing a greater likelihood that a student received the SBC treatment.

Conducting Matching

Once propensity scores were estimated, the next step involved matching SBC students in each matching block with potential comparison group students in the same block. Among the various matching methods, we used *radius matching*, by matching each treatment student with all potential comparison students whose propensity scores were within the pre-specified range ("caliper") of his/her score (±0.4 of the standard deviation of the propensity scores) in his/her block. We chose this method as our primary method because it balances the two important aspects of matching: closeness of the matches and size of the matched groups. Using a caliper ensures that each treatment student is matched with comparison students with sufficiently similar propensity scores. Including all comparison units within the caliper maximizes the size of the analytic sample and statistical power. We tested the robustness of the results via another matching method called *nearest neighbor matching* (see Appendix A for additional detail).

Assessing Baseline Balance

After matching SBC students to non-coached students, we checked to see whether the two groups were balanced (i.e., whether the treatment group was similar to the comparison group on background characteristics). Following Steiner et al. (2010) and Rubin (2001), we assessed the similarity ("baseline balance") between the treatment and matched comparison students using the standardized difference in the means of the matching characteristics between treatment and comparison students. We required that the difference be less than 15 percent (0.15) of a standard deviation in absolute value, which is a more stringent requirement than one imposed by the U.S. Department of Education's What Works Clearinghouse (WWC), which requires baseline differences between quasi-experimental treatment and comparison groups to be less than 0.25 standard deviation to meet Clearinghouse evidence standards.

Matching and checking of baseline balance continued until satisfactory balance was achieved. When balance was not achieved, the corresponding propensity score model was re-specified (e.g., by including interaction terms or higher-order terms) and the matching and baseline assessment processes were repeated. When satisfactory balance was achieved for all matching covariates, the resulting comparison group was treated as final.

Because we have several different outcomes, and *all* the possible data for every single student were not consistently available, the different outcomes are based on slightly different analytic samples. The primary reason for missing data on certain outcomes (i.e., cumulative GPA and good academic standing) reflects the fact that such data are provided by particular colleges. Nine colleges provided data for the evaluation, and enrollments for about 70 percent of the complete sample were concentrated within these nine colleges (the other 30 percent of students have never enrolled in one of these colleges or transferred out of this set of colleges).

To be thorough, we conducted matching and assessed baseline balance separately for each outcome. Exhibit 3-2 shows the averages of the matching characteristics for treatment and potential comparison students and the standardized differences for the two groups prior to matching; it also displays the same statistics *after* matching for one of our primary outcomes, persistence into the second year. Though pre-matching differences for some variables were above our desired threshold of 15 percent of a standard deviation—such as -0.38 standard deviation (SD) for fraction White, -0.29 SD for SAT scores, and -0.25 SD for English MCAS scores—the last column shows that matching reduced all pre-matching differences over the 0.15 threshold without distorting the balance for the variables balanced prior to matching. By confirming that the two groups are similar on observable characteristics such as these, we can rule out the possibility that these characteristics themselves account for any observed differences between SBC and comparison group students.

Exhibit 3-2: Baseline equivalence of treatment versus comparison students for the full sample

	Before Matching			After Matching		
	Treatment Mean	Control Mean	Std. Diff	Treatment Mean	Control Mean	Std. Diff
Student Characteristics						
Female	0.60	0.53	0.17	0.60	0.61	-0.02
English language learner	0.15	0.10	0.15	0.15	0.15	0.02
Free or reduced-price lunch status	0.87	0.71	0.36	0.87	0.84	0.08
Student has a high-incidence disability	0.06	0.07	-0.07	0.06	0.05	0.02
Student has a low-incidence disability	0.06	0.04	0.11	0.06	0.05	0.04
High school GPA	2.82	2.82	0.02	2.81	2.80	0.01
Student took an advanced course	0.57	0.50	0.22	0.55	0.55	0.00
Number of advanced courses taken	1.02	0.94	0.17	1.00	1.02	-0.01
SAT score	1,233.07	1,363.81	-0.29	1,240.11	1,245.24	-0.01
10th-grade ELA MCAS scaled score	-0.53	-0.22	-0.25	-0.52	-0.48	-0.05
10th-grade Math MCAS scaled score	-0.08	0.06	-0.04	-0.08	-0.08	0.01
Percentage of school days student was present	79.86	80.79	0.03	79.10	79.03	0.00

	Before Matching			After Matching		
	Treatment Mean	Control Mean	Std. Diff	Treatment Mean	Control Mean	Std. Diff
Number of suspensions	0.04	0.06	-0.07	0.04	0.05	-0.01
Number of extracurricular years	3.08	2.95	0.18	3.04	3.08	-0.02
Student talked with parent/guardian about postsecondary plans	0.21	0.22	0.02	0.20	0.21	0.01
Student received postsecondary info from a business or organization	0.47	0.44	0.08	0.46	0.47	-0.02
Student feels very well prepared for further education	0.50	0.58	-0.13	0.51	0.54	-0.05
Race/Ethnicity						
Black	0.41	0.36	0.14	0.41	0.42	-0.03
White	0.06	0.19	-0.38	0.07	0.08	-0.05
Asian/Pacific Islander	0.16	0.18	-0.03	0.15	0.11	0.12
Hispanic	0.36	0.27	0.18	0.36	0.38	-0.03
Native American	0.00	0.00	0.03	0.00	0.00	0.00
Other/Multiracial	0.01	0.01	-0.04	0.01	0.01	0.01
Educational Expectations						
High School Diploma	0.04	0.03	0.07	0.04	0.04	-0.01
Associate's Degree	0.04	0.03	0.03	0.04	0.04	0.03
Bachelor's Degree	0.30	0.28	0.02	0.30	0.27	0.06
Master's Degree	0.42	0.45	0.05	0.42	0.41	0.02
Undecided	0.05	0.07	-0.11	0.05	0.05	-0.02
High School Characteristics						
College-going rate	0.59	0.62	-0.12	0.60	0.60	0.00
Average MCAS – Math	47.83	50.30	-0.27	47.88	48.31	-0.06
Average MCAS – ELA	33.81	36.63	-0.18	33.97	34.28	-0.03
Average high school-level GPA	2.41	2.54	-0.28	2.42	2.41	0.02

ELA=English language arts; GPA=grade point average; MCAS=Massachusetts Comprehensive Assessment System; SAT=Student Achievement Test
Source: Program database, Boston Public Schools (BPS), MA DESE
Note: Based on the analytic sample for persistence into the second year.

3.1.3 How We Estimate the Average Impact of the Program for the Full Sample

To address the primary research question about the impact of SBC on all students, we estimated a linear regression model that included indicators for the matching blocks (defined based on student cohorts and postsecondary institutions) and the matching characteristics. To maximize statistical power, the model pools the two cohorts. The model was estimated separately for each outcome measure with the corresponding matched treatment and comparison groups.[8] The model included, as covariates, all matching characteristics used to construct the corresponding comparison group to increase precision of the impact estimates and be doubly robust (Bang and Robins 2005; Tan 2006).[9]

[8] The model for persistence into the third year includes only the fall 2013 cohort because this outcome was available only for that cohort at the time this report was prepared.

[9] Using the baseline characteristics in the matching process and also using them as covariates in the estimation of impacts is deemed to give the analyst two chances to get the "right" model specification (once

The models did not explicitly adjust the standard errors for the clustering of students within postsecondary institutions because we anticipated that such clustering was captured by the matching block indicators.[10]

We addressed the issue of multiple hypothesis testing (or the increased likelihood of finding a spurious effect as the number of tests increases) by (1) placing outcomes into larger groups ("domains"); (2) specifying the primary (confirmatory) outcomes in each domain; and (3) adjusting the statistical significance of impact estimates for primary outcomes using the Benjamini-Hochberg method for domains with multiple primary outcomes (Benjamini and Hochberg 1995; Schochet 2008). We conducted sensitivity tests with different covariate sets, different matched groups yielded by nearest neighbor matching, and alternative sample definitions; all of which yielded similar results. (See Appendix B for more information, including results from sensitivity analyses.)

3.1.4 How We Conduct Exploratory Analyses of Program Impacts

The third research question pertains to *moderating factors* related to potential variation in the impact of the SBC. We examined several potential moderators, including student baseline characteristics (e.g., students' demographic attributes and high school academic performance) and coaching features, such as frequency of coach-student interactions, and the implementation index.[11] These moderator variables explore variation in the strength of the impacts; for example, the impacts of SBC may be *greater* when students experience more coaching interactions. To simplify the analyses and ease the interpretation of results, we transformed each continuous or categorical moderator into a binary variable representing two subgroups that differed by the value of that moderator (e.g., fewer vs. more coaching interactions). We then calculated separate impact estimates for the two subgroups and assessed the magnitude and statistical significance of the *difference* in the subgroup-specific impact estimates.

We consider these *exploratory* analyses because (1) the subgroup analyses have less statistical power than full sample analyses, and (2) the moderators based on programmatic factors are post-treatment measures that may reflect program impacts (e.g., frequency of coaching interactions only occurs post-treatment and may be a function of the effectiveness of coaching itself). Thus, the differences in effects for the corresponding subgroups may not be fully attributable to those moderators. Further, given the number of subgroups explored, it is possible that any statistically significant impacts found may be due to chance variation and not true impacts. See Appendix B for an in-depth description of the analytic approaches used in these analyses.

---

in the propensity model and once in the impact model for the outcome measure). Therefore, these estimators are called "doubly robust."

[10] We tested the validity of this assumption by estimating hierarchical linear models (HLMs) that nest students within colleges. These models yielded virtually identical estimates.

[11] The study team developed an implementation index to summarize each nonprofit organization's level of implementation of core transition coaching components and the respective activities and processes within those components (see Linkow et al. 2015 for more detail). The index score represents the extent to which the organization engages in each specific practice or activity; it does not measure the overall quality of coaching provided to students.

3.2 Data Sources

The analyses rely on data from multiple sources: Boston Public Schools, Massachusetts Department of Elementary and Secondary Education, National Student Clearinghouse, colleges in which BPS students enrolled, the SBC program database.

Boston Public Schools (BPS) data include a broad set of measures related to graduating students from academic years 2012-13 and 2013-14. These data include high school academic measures and behavior (SAT, PSAT, and 10th-grade MCAS scores; coursework; absences and suspensions) and BPS Exit Survey responses.[12]

Massachusetts Department of Elementary and Secondary Education (MA DESE) provided student data for the entire state, including the same information as had been provided by BPS, with one exception: the district-specific student exit survey responses. As all UMass Boston students who graduated from BPS receive coaching similar to Success Boston's, additional data on students from outside the BPS school district were necessary for evaluating the impact of treatment on UMass Boston Success Boston students.

The **National Student Clearinghouse (NSC)** is a nonprofit organization that regularly collects enrollment and graduation information from colleges across the country. As of fall 2013, the NSC included student-level data on 95.4 percent of U.S. colleges and 98 percent of Massachusetts colleges. Using NSC data allows us to access data for all students regardless of whether or not they transfer colleges. For this evaluation, data on students' college enrollment and graduation come from the NSC, by way of BPS and MA DESE.

College administrative data was collected from nine colleges with at least 10 enrolled SBC students annually or strong partnerships with the Success Boston initiative. This administrative data on students include individual-level student records on college enrollment and persistence, academic achievement, and FAFSA renewal. These nine institutions, which enrolled 94 percent of the SBC students in 2014-15, are:

- Benjamin Franklin Institute of Technology
- Bridgewater State University
- Bunker Hill Community College
- Massachusetts Bay Community College (MassBay)
- Northeastern University
- Roxbury Community College
- Salem State University

[12] At the end of students' senior year in BPS high schools, they are asked to take a brief "exit" survey that asks questions about students' plans for next year and their educational and extra-curricular experiences while in high school. Note that BPS exit survey data were not used in the propensity score matching for students from University of Massachusetts Boston as the survey data were available only for BPS graduates.

- Suffolk University
- University of Massachusetts Boston (UMass Boston).

SBC program data, stored in Success Boston's Salesforce™ database,[13] include program participation records for individual students who participate in Success Boston Coaching. In this case, the SBC program data includes information about each coach-student interaction for all students served by each nonprofit coaching organization. Each individual student record has information on the following data elements: nonprofit coaching organization, assigned coach, whether the student is actively receiving coaching or has never enrolled, at which college the student is enrolled, the type of support provided to a student during a coaching session (i.e., academic, personal and emotional, financial, etc.), the duration of a given coaching session, and whether the coach provided direct or indirect support.

3.3 Measures

In this section, we first describe the outcomes and then define the measures used in our exploratory analyses to test whether program impacts varied depending on student and coaching moderators.

3.3.1 Outcome Measures

The outcomes for this evaluation fall into three domains: persistence, achievement, and financial aid. These outcomes are operationalized below. For domains with multiple outcomes measures, we further distinguish between *primary* and *exploratory* outcomes. Primary outcomes are those most closely related to the theory of change, which hypothesizes that the elements of one-on-one coaching that together address logistical, academic, financial, and emotional support topics can improve traditionally underrepresented college students' persistence and completion rates. Exploratory outcomes are also informed by the theory of change, as they may help explain why or why not impacts are detected on the primary outcomes, the most important of which is college completion (e.g. full-time status is not an outcome in and of itself but it is useful to examine because it is related to persistence and, ultimately, completion).. For the purposes of standardizing the amount of time for both 2013 and 2014 high school graduating classes, we restricted outcomes to the two-year period following high school graduation, with one exception: persistence into the third year is measured about two and a half years after high school graduation. Exhibit 3-3 lists details about each of the nine outcome measures. Wherever possible, data from colleges supplements NSC data, to ensure that we limit the number of students for whom outcome data are missing.[14]

---

[13] Salesforce™ is a cloud-based client relationship management database used widely in both for-profit and nonprofit sectors. SBC program data is known as "Salesforce data" internally.

[14] Though NSC includes data on almost every college nationally (95.4 percent) and in Massachusetts (98 percent), individual student records from any given college may be missing because students may block the release of their records under the Family Educational Rights and Privacy Act (FERPA) or because of matching errors due to misspellings of student names. NSC reports that, on average, 4.29 percent of students block the release of their records. Research on the extent of matching errors shows the NSC algorithm to be robust to student name variants (Dynarski, Hemelt, and Hyman 2013).

Exhibit 3-3 Outcome domains and measures

Outcome Measure by Doman	Primary or Exploratory	Years Post–High School	Sample Size	Data Source
Persistence Domain				
Persistence into the Second Year	Primary	1.5	2,946	NSC, college administrative data
Persistence into the Third Year	Primary	2.5	1,311	NSC, college administrative data
Continuous Enrollment	Exploratory	2	2,941	NSC, college administrative data
Full-Time Status	Exploratory	2	2,065	College administrative data
Achievement Domain				
Cumulative GPA	Primary	2	2,063	College administrative data
Good Academic Standing	Primary	2	2,065	College administrative data
Semesters Enrolled in Non-Credit-Bearing Courses	Exploratory	2	2,065	College administrative data
Credit Accumulation	Exploratory	2	1,963	College administrative data
Financial Aid Domain				
FAFSA Renewal	Primary	2	1,853	College administrative data

NSC is the National Student Clearinghouse. These data were provided through Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE).

Persistence Outcomes

This study uses two primary outcome measures to assess persistence: persistence into the second year and persistence into the third year of college. Two exploratory outcomes are included as well: continuous enrollment and full-time status.

Primary Outcomes

Persistence into the second year is a measure of whether students are enrolled in college in the fall (on October 1st) of their second year after high school, according to NSC data or college data. Persistence into the second year is a binary outcome (yes/no), in which a student enrolled in the fall semester immediately following high school graduation *and* the fall semester of the subsequent academic year was coded as persisting. For example, for a 2013 high school graduate to be counted as persisting into the second year, she would be enrolled in college in fall 2013 followed by fall 2014. All students enrolled in the fall of the second year, regardless of where they enrolled, are counted as persisting. This means that students who transferred colleges between fall 2013 and fall 2014 are considered to have persisted into the second year. Additionally, any students who graduated before the second fall are included as positive outcomes on this measure. Students whose records were not present in either dataset in the fall of their second year after high school graduation, and had not previously graduated from a college, were assumed not to be enrolled in college at that time point.

Persistence into the third year is a measure of whether students are enrolled in college in the fall (on October 1st) of their third year after high school, according to NSC data or college data. Consistent with the approach described above, persistence into the third year is a binary outcome (yes/no) in which a student who enrolled in the fall immediately following high school graduation and

the fall semester of the *second* subsequent academic year is coded as persisting.[15] For example, for a 2013 high school graduate to be counted as persisting into the third year, she would be enrolled in fall 2013 and again in fall 2015. Similar to persistence into the second year, all students enrolled in the fall of the third, regardless of where they enrolled, are counted as persisting. This means that students who transferred colleges between fall 2013 and fall 2015 are considered to have persisted into the third year. Additionally, any students who graduated before the third fall are included as positive outcomes on this measure. Students whose records were not present in either dataset in the fall of their third year after high school graduation, and had not previously graduated from a college, were assumed to be not enrolled in college at that time point.

It is important to note that persistence into the third year could be measured only for the 2013 BPS graduates, as data about third-year persistence for the 2014 graduates were not available in time for inclusion in this report. Exhibit 3-4 displays how each persistence measure is defined.

Exhibit 3-4: Annual persistence measures

College-Entering Cohort	Persisted into the Second Year	Persisted into the Third Year
2013	Enrolled in Fall 2013 and Fall 2014	Enrolled in Fall 2013 and Fall 2015
2014	Enrolled in Fall 2014 and Fall 2015	Not yet available

Exploratory Outcomes

Continuous enrollment represents a count of continuous college semesters in which a student was enrolled (excluding summer enrollments), according to NSC and college data. Values could range from 0 to 4 for all students in the sample. Students whose records were not present in either NSC or the college datasets for a given semester were assumed to not be enrolled in college at that time point.

Semesters enrolled full-time refers to the percent of semesters in which students were enrolled full-time, relative to the four possible semesters of full-time enrollment since high school graduation. This measure is based on data provided by nine partner colleges, and therefore the outcome is estimated only for students who attended those nine colleges;[16] students enrolled elsewhere for any portion of the two years following high school graduation are coded as missing data for this measure. Values range from 0 to 1, where 0 indicates a student was never enrolled full-time and 1 represents a student who has always been a full-time student.

Achievement Outcomes

The evaluation focuses on two primary outcome measures of student achievement: *cumulative grade point average* (GPA) and *good academic standing*, as well as two exploratory outcomes: *semesters enrolled in non-credit-bearing courses* and *credit accumulation*. Again, these outcomes are estimated only for students who attended the nine colleges providing data; students enrolled elsewhere for any portion of the

[15] Students who did not enroll in college in the second year after high school can still be considered to have persisted into the third year. Therefore, this outcome does not measure continuous enrollment to the third year.

[16] Information about full-time and part-time is sometimes available from the National Student Clearinghouse, but because this is an optional data field, its data are not comprehensive.

two years following high school graduation are coded as missing data.

Primary Outcomes

Cumulative GPA is a continuous measure that ranges from 0 to 4, where A=4.0, B=3.0, C=2.0, and D=1.0, reflecting data current as of the most recent semester completed.

Good academic standing assesses whether a student consistently maintained a semester and cumulative GPA of ≥2.0, or earned more than 66 percent of credits attempted in a given semester. The final score is represented as a proportion, by dividing the number of semesters of good academic standing by 4 (as four *possible* semesters had elapsed since high school graduation).

Exploratory Outcomes

Semesters enrolled in non-credit-bearing courses describes the number of fall and spring semesters in which college students had enrolled in non-credit-bearing courses (i.e., courses that did not count toward graduation). This measure ranges from 0 to 4, representing the total number of semesters in which it was (theoretically) possible for students to enroll in such courses.

Credit accumulation is a count of the total number of credits successfully completed, as of the students' most recent semester. The final score represents a proportion of the total number of credits completed, divided by the total number of credits needed to graduate. The number of credits needed to graduate varies from school to school; we followed the graduation requirements set by each institution.

Financial Aid Outcomes

FAFSA renewal indicates whether students completed and submitted a Free Application for Federal Student Aid renewal form in their first year of college. Only data for the first year of college was considered, in order to standardize the amount of time for the 2013 and 2014 cohorts. This measure is dichotomous, such that 0 corresponds to students *not* having renewed their FAFSA applications, and 1 corresponds to students having renewed the application. This outcome is estimated for students who attended only the seven[17] colleges providing data; students enrolled outside of these colleges for any period of time during the two years following high school graduation are coded as missing data for this measure.

3.3.2 Moderators

To gain a deeper understanding about whether, and if so, how, observed impacts of SBC varied as a function of particular student characteristics or features of coaching, we conducted several exploratory analyses. These analyses are exploratory because (1) they investigate impacts on subsets of the sample, and because the overall study sample has been divided into subgroups, the statistical analyses may be less able to detect educationally meaningful program impacts than analyses based on the full sample; and (2) the programmatic features occur only after students have enrolled and begun to participate in the coaching program, and features may reflect students' experiences with coaching or other events, which makes it difficult to distinguish between differences in outcomes driven by the

[17] Two colleges, MassBay Community College and Bridgewater State University, did not provide administrative data on FAFSA renewal.

features of the coaching experienced by students (variation in program impacts), on one hand, and other factors which do not reflect true program impacts.[18]

Moderators were dichotomized to maximize the sizes of the subgroups and, therefore, statistical power and to generate easily interpretable comparisons between subgroups. These moderators of program impacts are operationalized below.

Four student characteristics are explored as moderators. For each moderator two subgroup categories are formed. Created from MA DESE data, student characteristics explored as moderators include *gender* (categorized as male or female); *underrepresented minority* (categorized as traditionally underrepresented in postsecondary education for Black, Hispanic, Native American or Other/Multiracial students, and categorized as not traditionally underrepresented for White and Asian/Pacific Islander students); *student GPA* (categorized as high or low, based on the median of the GPA distribution, where high is greater than 2.93 and low is less than or equal to 2.93); and *type of college* in which a student first enrolls (two-year or four-year institution).

These specific moderators were selected because previous research indicates they are related to college completion, the ultimate goal of SBC. For example, female students complete college at higher rates than male students (Shapiro et al. 2015); underrepresented minority group students complete college at lower rates than students not underrepresented in postsecondary education (U.S. Department of Education 2016; Haskins 2008; Bailey and Dynarski 2011); students with higher GPAs complete college at higher rates than students with lower GPAs (Belfield and Crosta 2012); and students first enrolling at four-year institutions complete a college degree at higher rates than students first enrolling at two-year institutions (Shapiro et al. 2015).

Four features of coaching are explored: *content focus*, *frequency*, *duration*, and *implementation index score*. These moderators reflect findings described in the previous implementation study (Linkow et al. 2015), which highlighted these as important features of coaching that vary across students and organizations. Data for all four of these moderators come from the SBC program database. For each moderator, students were divided into two groups, high and low, based on the median value of the moderator. Exhibit 3.5 displays the low and high cutoffs for each moderator.

[18] Students may experience coaching differently for multiple reasons—many of which can plausibly be accounted for by the matching process used in this study. However, because the matching uses data collected *before* coaching starts, it is still possible that either or both of the following could be related to the features of coaching *and* the outcomes of interest: a) student characteristics that were not captured in the matching (e.g., responsiveness to coaching), or b) students' experiences that occur after matching (e.g., success with college coursework). That possibility means we cannot causally link differences in features of coaching to differences in outcomes. For example, a student may struggle in her first year in college, for reasons completely separate from coaching and/or the specific characteristics used in the matching, and that student may seek out coaching support more often. In this case, more coaching would be related to poor college outcomes. On the other hand, a student who is succeeding academically, also for reasons that have nothing to do with coaching and characteristics used in the matching, may seek out coaching more frequently to learn about how to do even better. In this case, more coaching would be related to more positive outcomes. In both cases, students are self-selecting into more frequent coaching yet their outcomes are caused by factors unrelated to the effectiveness of coaching.

- *Content focus* measures how many coach interactions a student experienced that were focused on one of four topic areas: academic, financial aid, managing life responsibilities, and career planning. This moderator captures interactions across a two-year time period (August 1, 2014, through June 15, 2016, which spans both the 2014-15 and 2015-16 academic years and includes the summer in between). Four count variables were created, one for each of the topic areas.
- *Frequency* measures the number of interactions across all modes (in-person, text, email, phone, and social media) between students and their coach across the same two-year time span as described above.
- *Duration* measures the average length (in minutes) of all one-on-one interactions (in person or phone) over the same two-year time span as described above.
- *Implementation index score* summarizes information about implementation program wide during the 2014-15 academic year. The index integrates information from multiple data sources (interviews with coaching organization directors and coaches, the SBC student surveys, SBC program data, and document reviews) to quantify the extent to which the nonprofit coaching organizations implemented various components of Success Boston Coaching. The total score for the index ranged from 15 to 45. More information on the implementation index can be found in *Degrees of Coaching: Success Boston's Transition Coaching Model* (Linkow et al. 2015).

Exhibit 3-5: Subgroup cutoffs for features of coaching moderators

Features of Coaching Moderators	Low Range	High Range
Content Focus		
Academic Focus	0-4 meetings	> 4 meetings
Financial Aid Focus	0-1 meetings	> 1 meeting
Career Focus	0-1 meetings	> 1 meeting
General Life Focus	0 meetings	> 0 meetings
Frequency	0-9 meetings	> 9 meetings
Duration	0-26 minutes	> 26 minutes
Implementation Index	31-40 points	> 40 points

3.4 Limitations

The study faces some methodological limitations: (1) data availability, (2) matching students across high schools and school districts, and (3) simply because it uses a quasi-experimental design rather than an experimental design.

First, data are available only on certain outcomes (i.e., *cumulative GPA* and *good academic standing*) on the 70 percent of students in the evaluation sample who were enrolled in the nine colleges that provided data. Students who did not enroll in these nine colleges or transferred from one of the nine to another college are excluded from the models. Because of this, we allowed the comparison group to shift with availability of outcome data, and we show in Appendix Exhibit A-8 that baseline equivalence is achieved for each outcome. The sensitivity analysis presented in Appendix Exhibit B-3 shows that the impacts on persistence outcomes, which are based on the most complete samples (from

NSC data), are robust to limiting the sample to only students enrolled in the nine colleges submitting data for the evaluation.

A second limitation is that students within a given college are matched across high schools, and in the case of UMass Boston students, across school districts. Because sample sizes were too small to allow for matching students from the same high school attending the same college, matching is within colleges and accounts for features of high schools. The process addresses both differences in college experiences and high school characteristics to eliminate historical and locational differences (bias) in students' previous educational experiences.

Third, it is possible that the local and focal matching approach did not sufficiently control for potentially confounding factors because we were not able to use an experimental (random assignment) design. To the extent that the distribution of all important confounders is equalized across participants and the matched comparison group, our quasi-experimental design should produce impact estimates with minimal bias and good power, relative to other quasi-experimental designs.

4. How Does Participation in Coaching Affect College Outcomes?

This chapter presents the results from the study's impact analyses, which assess whether participation in Success Boston Coaching leads to better college outcomes for coached students. The SBC program offers students one-on-one, in-person support from a coach about diverse transition and college success topics, including life skills, study skills, help-seeking skills, accessing financial aid, time-management strategies, setting academic and career goals, understanding college culture, and balancing school, work, and life. We focus specifically on program impacts for fall 2013 and 2014 college entrants, who graduated from high school three and two years ago, respectively. The findings are organized according to three outcome domains: persistence, achievement, and financial aid.

Our analytic approach pools the estimated impact of SBC on student persistence, academic achievement, and financial aid across both cohorts of students. Results for one outcome (persistence into the third year of college) are presented only for the fall 2013 cohort, as data for the 2014 cohort were not available in time for this report. To measure outcomes consistently across these two cohorts, all measures (except persistence into the third year) are calculated for the first two years of expected college enrollment. The exhibits that follow present, for each outcome, the treatment group mean (in purple) below the comparison group mean (in blue). The comparison group is weighted (i.e. adjusted) based on baseline student characteristics to represent the mean outcomes for the treatment group had they not received the intervention. As such, the adjusted comparison group means represent the mean outcomes that would have been observed for the treatment group in the absence of SBC.

Key Findings

The analyses estimate that SBC students have more-positive early college outcomes than their peers not participating in SBC. Specifically, SBC students are:

- more likely to persist into their *second* year of college (83 percent for the SBC treatment group vs. 75 percent for the non-coached comparison group)
- more likely to persist into their *third* year of college (75 percent vs. 62 percent)
- enrolled for more continuous semesters (average of 3.43 semesters vs. 3.24 semesters)
- enrolled full-time for roughly three of possible four semesters (72 percent vs. 65 percent of four semesters)
- maintaining higher cumulative GPAs (2.45 vs. 2.26)
- more likely to be in good academic standing at their college (78 percent vs. 71 percent)
- accumulating more college credits (of the credits necessary to graduate at their college, completed 39 percent vs. 36 percent)
- more likely to complete FAFSA renewals for their second year of college (85 percent vs. 78 percent).

The following sections detail results for primary and exploratory outcomes for each domain.

4.1 Persistence

A key expectation of the SBC model is that students are more likely to persist in college as coaches help them navigate and manage the academic, financial, and social-emotional challenges typically faced by beginning college students. To test this hypothesis, this evaluation uses two primary outcome measures to assess persistence: persistence into the second year of college and persistence into the third year of college. These persistence outcomes measure whether students who enrolled in college after their high school graduation returned to college in the fall of each succeeding academic year. Persistence into the second year of college indicates whether students in the 2013 and 2014 cohorts enrolled in the fall semester of 2014 and 2015, respectively. Persistence into the third year of college reflects whether students in the 2013 cohort enrolled in the fall semester of 2015.

As seen in Exhibit 4-1, 81 percent of the full analytic sample (i.e., all SBC treatment students and all potential non-coached comparison students) persisted into the second year of college. This estimate is higher than the national average of 72 percent among fall 2014 college entrants (NSC 2016). Persistence into the third year of college dropped for the sample (of fall 2013 college entrants), to 72 percent.

Two exploratory outcomes are examined to assess more fine-grained aspects of students' continued persistence toward degree completion: continuous enrollment and full-time status. Continuous enrollment measures the number of continuous semesters that a student was enrolled (excluding summer enrollments). As seen in Exhibit 4-1, SBC and comparison students collectively were continuously enrolled for about three semesters, on average. Because the maximum possible number of continuously enrolled semesters was four, this estimate suggests that the average student had experienced an interruption in college enrollment by the middle of their second year of college. Semesters enrolled full-time refers to the a proportion of semesters in which students were enrolled full time, out of the first four college semesters after high school graduation. Descriptive results show that, on average, students in the full sample were enrolled full-time for just over two and a half of their first four semesters (66 percent).

Exhibit 4-1: Persistence measures for the full analytic samples

Outcome	N	Mean
Persistence into Second Year of College	2,946	81%
Persistence into Third Year of College	1,311	72%
Continuous Enrollment	2,941	3.37
Semesters Enrolled Full-Time	2,065	66%

Source: NSC data from BPS and MA DESE

The overall rates of persistence described above provide some insight into general patterns in estimated persistence results for both SBC students in the treatment group and non-coached students in the comparison group. Next, we describe differences between the two groups. SBC had a positive impact on all four persistence outcomes.

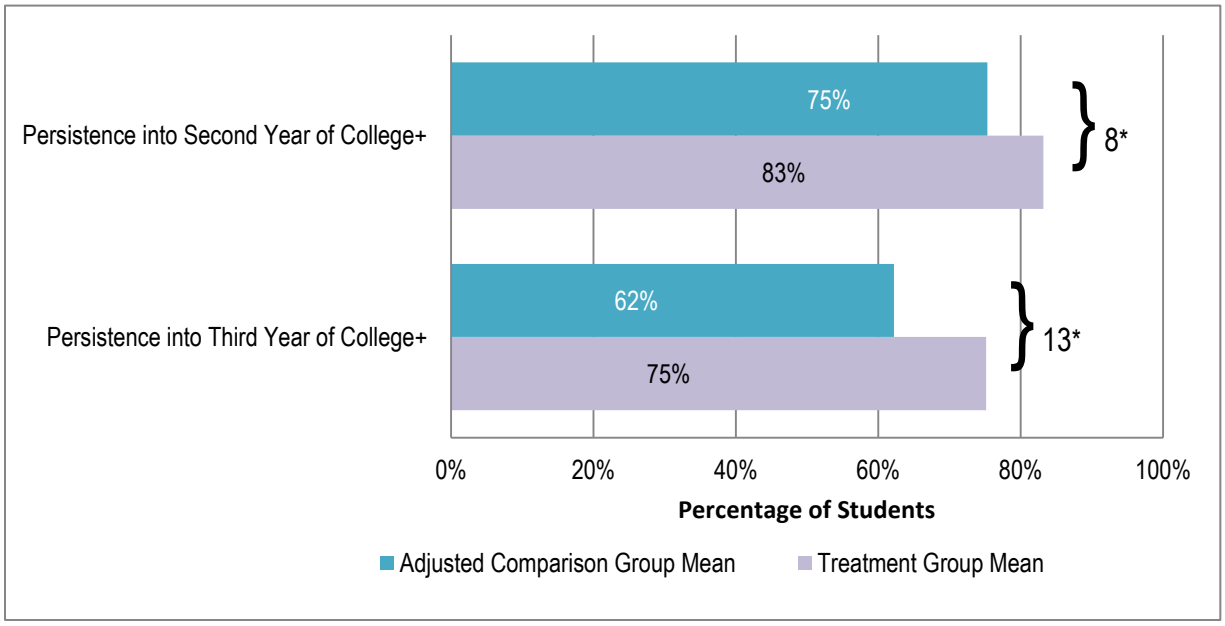
4.1.1 Persistence into the Second and Third Years of College

The top two bars in Exhibit 4-2 show that 83 percent of SBC students in the treatment group and 75 percent of non-coached students in the comparison group persisted into the second year of college. The 8.1 percentage point impact of SBC on persistence is positive and statistically significant. Both

groups persisted into the second year at higher rates than the 72 percent national average starting college in fall 2014 (NSC 2016).

The bottom two bars in Exhibit 4-2 show that SBC continues to have an impact on persistence into students' third year of college. The significant impact of SBC on persistence into the third year is estimated to be 13 percentage points (because this outcome is measured only for the 2013 cohort, it should be interpreted with caution due to the smaller sample size). Three-quarters (75 percent) of SBC students in the treatment group persisted into the third year of college, whereas less than two-thirds (62 percent) of students in the comparison group did. Because two primary outcomes within the single domain of persistence are tested, statistical significance tests use the Benjamini-Hochberg correction.

Exhibit 4-2: Impact of SBC on persistence into second and third years of college



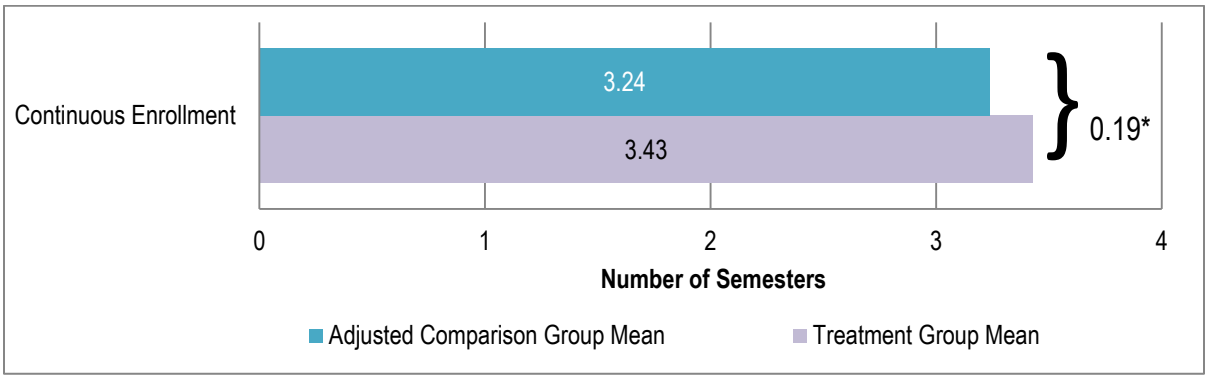
Notes: N=2,512 for overall sample, N=715 for treatment, and N=2,231 for comparison for persistence into the second year. N=1,103 for overall sample, N=324 for treatment, and N=987 comparison for persistence into third year. Students are considered to persist if they enroll year to year or if they complete a certificate. (Completers by second year in college T=3, C=6. Completers by third year in college T=4, C=20.)
* Impact is significant at the 5 percent level.
+ Significance determined with the Benjamini-Hochberg correction.
Source: NSC data from BPS and MA DESE
Exhibit Reads: The impact of coaching on persistence into the third year of college is statistically significant at 13.1 percentage points. 75.2 percent of students who participated in coaching persisted into the third year of college, whereas 62.2 percent of students who did not participate in coaching persisted into the third year of college.

4.1.2 Continuous Enrollment

Continuous enrollment is predictive of quicker path to degree completion (Crosta 2014; Shapiro et al. 2015). Presumably, students participating in SBC would remain enrolled in college continuously, and thereby be making steady progress toward degree completion. Exploration of continuous enrollment, shown in Exhibit 4-3, suggests that SBC students in the treatment group are continuously enrolled for slightly longer than non-coached students in the comparison group: an average of 3.43 semesters

versus 3.24 semesters. Assuming that the average semester is 15 weeks, 0.19 semesters represents about 3 weeks of semester.

Exhibit 4-3 Impact of SBC on number of semesters continuously enrolled

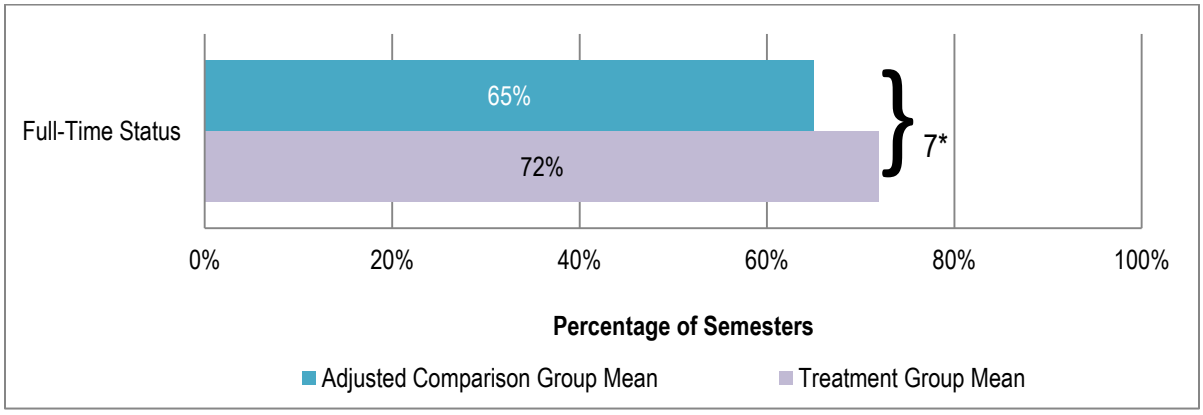


Notes: N=2,524 for overall sample, N=711 for treatment, and N=2,230 for comparison. Counts semesters continuously enrolled in any institution.
Source: NSC data from BPS and MA DESE
* Impact is significant at the 5 percent level.
Exhibit Reads: The impact of SBC on maximum number of semesters spent continuously enrolled is statistically significant, at about one-fifth of a semester. SBC students were enrolled, on average, for 3.43 continuous semesters compared with 3.24 for non-coached students.

4.1.3 Semesters Enrolled Full-Time

Because they likely accumulate college credits faster, students who are enrolled full-time may be more likely to complete a degree within a shorter time period than those enrolled part-time. The SBC has a positive and statistically significant impact of 7 percentage points on the percentage of semesters in which students are enrolled full-time. Exhibit 4-4 shows that, on average, SBC students in the treatment group enrolled full-time for about three of the possible four semesters (72 percent of four semesters), whereas non-coached students in the comparison group enrolled full-time for about two-and-a-half semesters (65 percent of four semesters).

Exhibit 4-4: Impact of SBC on semesters enrolled full-time



Notes: N=2,065 for overall sample, N=634 for treatment, and N=1,431 for comparison. Calculated as the percentage of semesters in which students are enrolled full-time out of the total possible number of semesters they could have been enrolled (four semesters).
* Impact is significant at the 5 percent level.
Source: College administrative data
Exhibit Reads: The impact of coaching on proportion of semesters spent enrolled full-time is statistically significant at 7 percentage points. For students who participated in coaching, the mean percentage of semesters spent enrolled full-time was 72 percent, whereas the mean was 65 percent for students who did not participate in coaching.

The positive findings across all persistence outcomes are noteworthy for several reasons. First, these corroborate prior research conducted by Sum and colleagues (2014), which found preliminary evidence of a positive and statistically significant effect of SBC on college persistence. Second, the findings are consistent with evaluations of other coaching interventions shown to improve students' likelihood of persisting in college (e.g., Bettinger and Baker 2014).

4.2 Achievement

Another key hypothesis of the SBC evaluation is that coaching supports can help students manage various academic challenges that they may face in college, ranging from difficult coursework to course selection and time management. By helping students access available campus supports and cope with stressors related to the academic demands of college, coaches can potentially help students improve their academic achievement.

The analyses described below examine the impact of SBC on two primary outcome measures of academic achievement: cumulative grade point average (GPA) and good academic standing. In addition, we explore impacts for two exploratory outcomes: semesters enrolled in non-credit-bearing courses and credit accumulation.

The first outcome, cumulative GPA, is drawn from students' most recent semester enrolled and corresponds with the following values: A=4.0, B=3.0, C=2.0, D=1.0. On average, students across the full analytic sample had GPAs that fell in the C+/B- range (2.38 points). Nationally, among college students in the 2011-12 academic year, about half (48.4 percent) report a GPA in the C to B range: 23.2 percent receiving mostly Bs, 16.1 percent receiving Bs and Cs, and 9.1 receiving mostly Cs (NCES 2014).

Good academic standing is calculated consistently across the partner colleges; it reflects whether students maintained semester-specific and cumulative GPAs of 2.0 or better, or earned more than 66 percent of credits attempted in a given semester. The final score is represented as a proportion of the number of semesters spent in good academic standing out of the maximum of four possible semesters. Across the full analytic sample, students spent about three semesters (74 percent of four possible semesters) in good academic standing.

Descriptive results on the full analytic sample show that, on average, students spent about one semester enrolled in non-credit-bearing courses, and half of students (50.2 percent) took at least one non-credit-bearing course, a rate nearly identical to the 50.4 percent of students nationally (NCES 2012).[19]

To explore how students' academic achievement profiles suggest they are moving along the path toward completion, the analyses also investigate credit accumulation. Because the number of credits needed to graduate varies from school to school, we define credit accumulation as the total number of credits successfully completed, divided by the total number of credits needed to graduate at that student's college.[20] Descriptive results for the full analytic sample show that, on average, by two years after high school graduation, students had completed 38 percent of the credits needed to graduate. The rates for credit accumulation are largely consistent for those enrolled in two-year and four-year colleges (36 percent and 39 percent, respectively).

Given that this outcome reflects progress after two years of college enrollment, this suggests that if students were on track to complete their two- and four-year degrees within the respective two- and four-year windows, we might expect credit accumulations to be closer to 100 percent and 50 percent, respectively. Rather, these percentages suggest that it will take students enrolled in two-year institutions about five-and-a-half years to complete their degrees; that is, after about two years, they have about one-third of the required credits. For students enrolled in four-year institutions, these data suggest it will take them about five years to complete their degrees; that is, after about two years, they have accumulated roughly two-fifths of the credits required.

Exhibit 4-5: Achievement measures for the full analytic samples

Outcome	N	Mean
Cumulative GPA	2,063	2.38
Good Academic Standing	2,065	74%
Semesters Enrolled in Non-Credit-Bearing Courses	2,065	0.92
Credit Accumulation	1,983	38%

Source: College administrative data

Next, we describe differences between the treatment and comparison groups. SBC has a positive impact on both primary outcomes (cumulative GPA and good academic standing) and on one of the exploratory outcomes (credit accumulation).

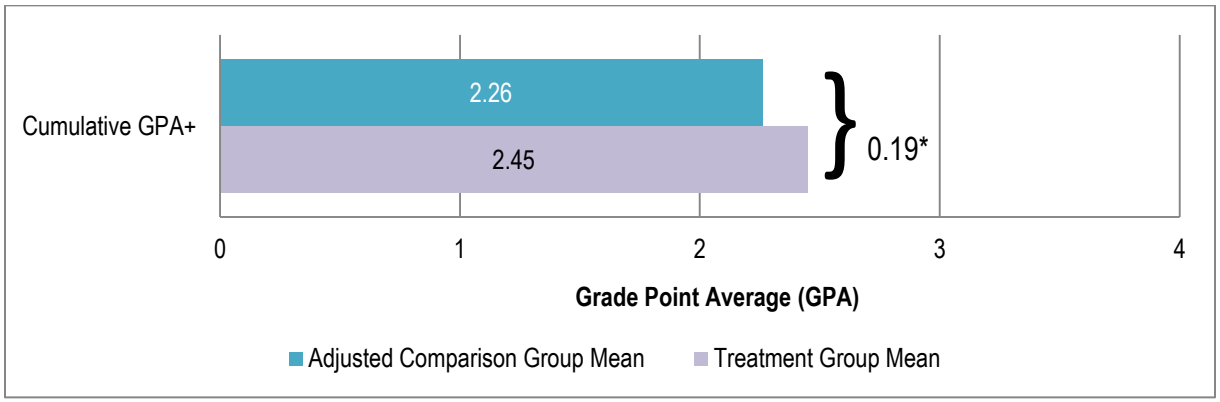
[19] http://nces.ed.gov/pubs2013/2013151rev.pdf

[20] When credits necessary to graduate vary by major or school within a college, credits necessary to graduate from the most common major or largest school were used.

4.2.1 Cumulative GPA

Implementation data about SBC document that academic topics (e.g., reviewing course syllabi, course selection and degree planning, connecting students to on-campus tutoring services) were the most prevalent topics addressed during coach-student interactions during the 2014-15 academic year; 63 percent of all 8,685 coaching interactions included an academic focus (Linkow et al. 2015). Exhibit 4-6 illustrates that SBC students in the treatment group have higher cumulative GPAs, on average, than non-coached students in the comparison group. The impact of SBC on cumulative GPA is statistically significant, although the magnitude of the impact is fairly modest, at one-fifth of a point.

Exhibit 4-6: Impact of SBC on cumulative GPA

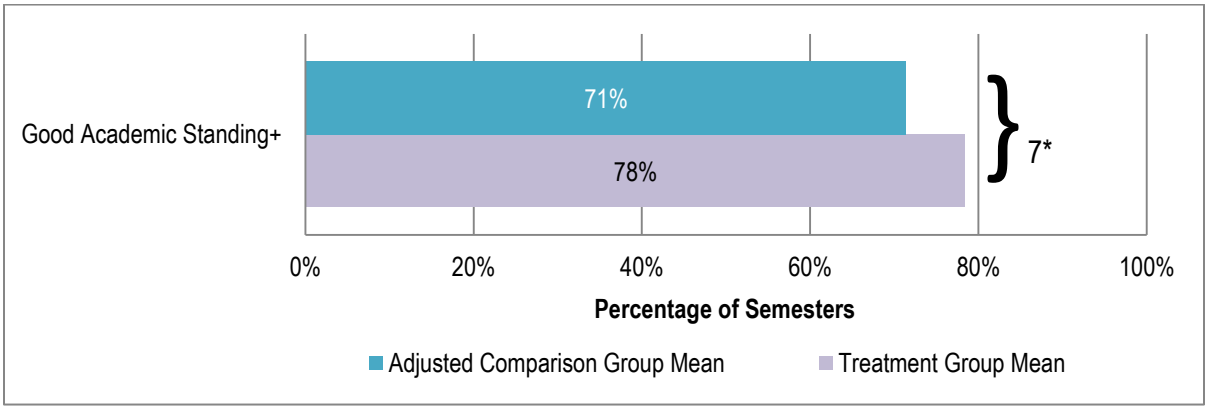


Notes: N=2,063 for overall sample, N=634 for treatment, and N=1,429 for comparison. Taken as cumulative GPA from the most recent GPA for which we had data available.
* Impact is significant at the 5 percent level.
+ Significance determined with the Benjamini-Hochberg correction.
Source: College administrative data
Exhibit Reads: The impact of coaching on cumulative GPA is statistically significant at 0.19 points. SBC students had a mean GPA of 2.45, compared to a mean GPA of 2.26 for non-coached students.

4.2.2 Good Academic Standing

SBC students are also estimated to spend more semesters in good academic standing (78 percent of semesters) than are non-coached students in the comparison group (71 percent of semesters). The impact on time spent in good academic standing is statistically significant at 7 percentage points. Spending more time in good academic standing could translate into faster pathways to college completion for students who are not placed on academic probation, which often means taking the subsequent semester off and/or losing financial aid for the next semester.

Exhibit 4-7: Impact of SBC on good academic standing



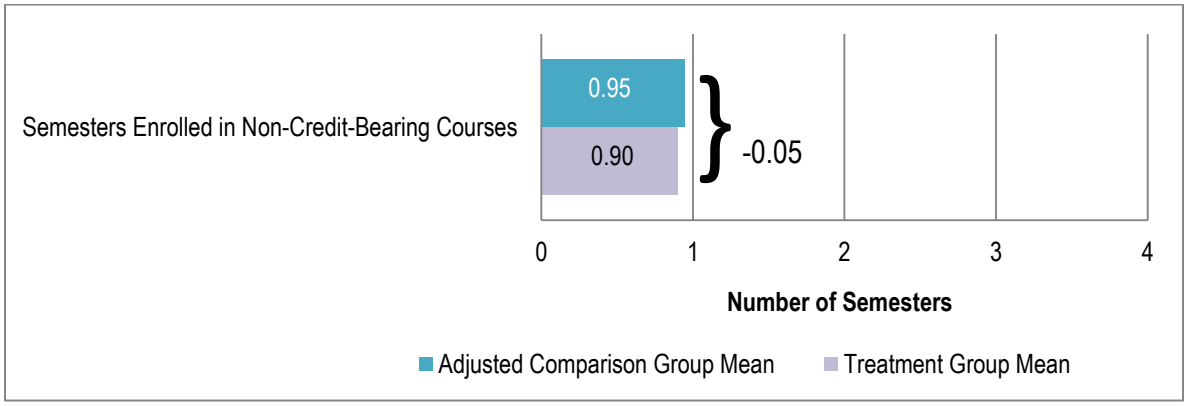
Notes: N=2,065 for overall sample, N=634 for treatment, and N=1,431 for comparison.
Students are considered to be in good standing if they consistently maintain a cumulative GPA of ≥2.0 or earn more than 66 percent of cumulative credits attempted in a given college measured each semester, as a proportion of total semesters.
* Impact is significant at the 5 percent level.
+ Significance determined with the Benjamini-Hochberg correction.
Source: College administrative data
Exhibit Reads: The impact of coaching on proportion of semesters spent in good academic standing is statistically significant at 7 percentage points. For students who participated in coaching, the mean percentage of semesters spent in good standing was 78 percent versus 71 percent for students who did not participate in coaching.

4.2.3 Semesters Enrolled in Non-Credit-Bearing Courses

There is no statistically significant impact of SBC on the number of semesters during which students were enrolled in non-credit-bearing courses (i.e., "developmental courses" that confer no credit toward completion of a degree or certificate). Both SBC students and non-coached students spend roughly one semester enrolled in non-credit-bearing courses. Because this outcome measures a potential adverse outcome,[21] a negative estimated impact would mean that SBC students are spending *less* time in non-credit-bearing courses, which in turn, would mean a positive outcome for the SBC program.

[21] Bailey, Jeong, and Cho (2010) estimate that one-third of community college students who are referred to a developmental math sequence fail to complete the sequence, and consequently do not complete a degree or credential.

Exhibit 4-8: Impact of SBC on semesters enrolled in non-credit-bearing courses

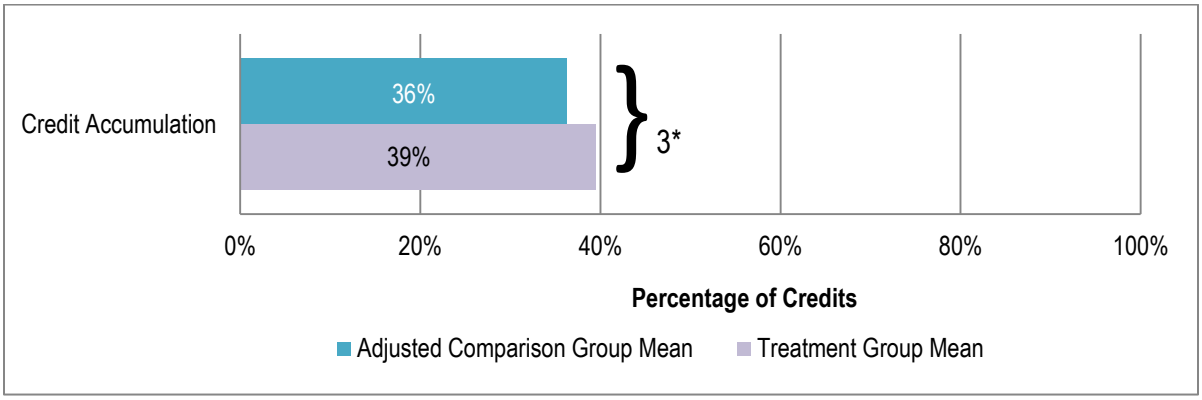


Notes: N=2,065 for overall sample, N=634 for treatment, and N=1,431 for comparison. Actual credits needed for graduation vary by college.
* Impact is significant at the 5 percent level.
Source: College administrative data
Exhibit Reads: There is no impact of coaching on the number of semesters enrolled in non-credit-bearing courses. For students who participated in coaching, the mean number of semesters enrolled in non-credit-bearing courses was 0.90 percent versus 0.95 semesters for students who did not participate in coaching.

4.2.4 Credit Accumulation

Exploratory analysis of credit accumulation demonstrates that SBC students are completing more credits toward graduation than are their peers in the comparison group. Two years after enrolling in college, SBC students and non-coached students had completed 39 percent and 36 percent, respectively, of the credits needed to graduate at their college. The impact is estimated to be 3 percentage points, which means that SBC students had completed 12 percent more credits toward graduation than had non-coached students. Though SBC students may have accumulated slightly more credits toward graduation, they, like their non-coached peers, have not accumulated sufficient credits to graduate within 100 percent time (i.e., two years for those pursuing Associate's degrees and four years for those pursuing Bachelor's degrees).

Exhibit 4-9: Impact of SBC on credit accumulation



Notes: N=1,874 for overall sample, N=592 for treatment and N=1,371 for comparison. Actual credits needed for graduation vary by college.
* Impact is significant at the 5 percent level.
Source: College administrative data
Exhibit Reads: The impact of SBC coaching on percentage of credits accumulated toward graduation is statistically significant at 3 percentage points. SBC students' mean percentage of credits accumulated toward graduation was 39 percent, compared with 36 percent for students who did not participate in coaching.

4.3 Financial Aid

One of the goals of SBC is to help students navigate the financial aid process, and presumably help reduce the gap between the cost of college and what students can actually afford. To this end, the SBC evaluation examines Free Application for Federal Student Aid renewal, measuring whether students complete and submit a FAFSA renewal application for their second year of college, unlocking access to federal student aid.

4.3.1 FAFSA Renewal

A large majority (80 percent) of both SBC and non-coached students renewed their FAFSA for their second year of college. This rate is slightly higher than the college-entering class of 2004 nationally, 75.4 percent of whom renewed for the second year of college (Bird and Castleman 2016).

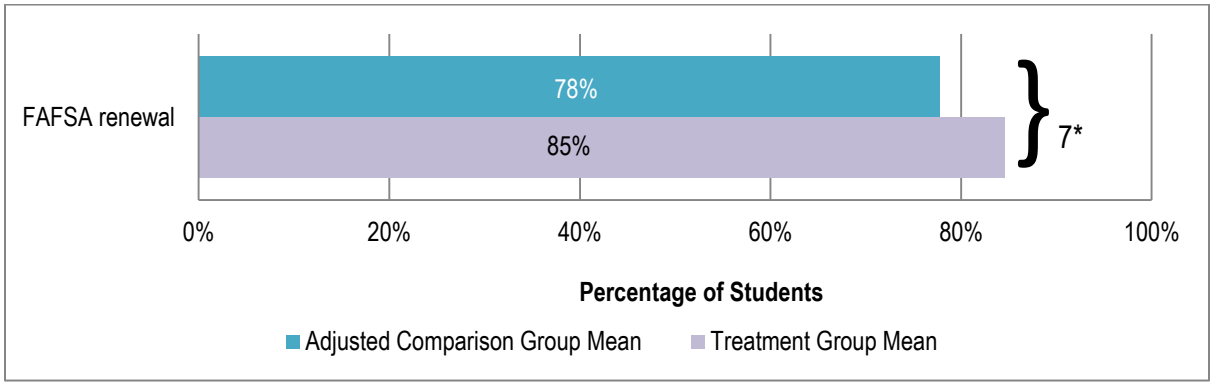
Exhibit 4-10: Financial aid measure for the full analytic sample

Outcome	N	Mean
FAFSA Renewal	1,853	80%

Note: Seven of the nine colleges provided administrative data on FAFSA renewal.
Source: College administrative data.

That high proportions of SBC and non-coached students in the group renew their FAFSAs for their second year in college reflects the high proportion of students eligible for federal financial aid in the study sample (86.6 percent of SBC students and 83.6 percent of those not coached were eligible for free or reduced-price lunch in high school). Though the majority of both groups of students renew their FAFSAs, SBC students in the treatment group renew at a higher rate, and the difference in renewal rates (7 percentage points) is positive and statistically significant. Among the treatment students, 85 percent renewed their FAFSA for their second year of college versus 78 percent of comparison students.

Exhibit 4-11: Impact of SBC on FAFSA renewal



Notes: N=1,811 for overall sample, N=551 for treatment, and N=1,302 for comparison.
* Impact is significant at the 5 percent level.
Source: College administrative data
Exhibit Reads: There is a statistically significant impact (7 percentage points) of coaching on the percentage of students who submitted FAFSA renewal forms for their second college year.

4.4 Learning Points

The one-on-one transition supports provided by SBC across a wide-ranging set of topics are hypothesized to improve student outcomes along several important dimensions, including how long students persist in college, their academic achievement while in college, and their awareness that applications are required in order to access available federal financial aid. Analysis of early outcomes explored several mechanisms through which SBC can increase the college completion rates of Boston students. Relying on a rigorous, quasi-experimental design—namely local and focal matching—the results presented in this chapter demonstrate that SBC has consistent, statistically significant, and positive impacts on students across three domains: persistence, achievement, and financial aid. Results for all primary outcomes indicate positive statistically significant impacts, and impacts for three of four exploratory outcomes are also positive and statistically significant.

Exhibit 4-12: Summary of impact results

Domain	Outcome Measure	Magnitude of Impact
Primary Outcomes		
Persistence	Persistence into the Second Year*	+11% *
	Persistence into the Third Year	+21% *
Achievement	Cumulative GPA	+8% *
	Good Academic Standing	+10% *
Financial Aid	FAFSA Renewal	+9% *
Exploratory Outcomes		
Persistence	Continuous Enrollment	+6% *
	Full-Time Status	+11% *
Achievement	Semesters in Non-Credit-Bearing Courses	–5%
	Credit Accumulation	+8% *

+ Indicates a positive result; – indicates a negative result.
* Statistically significant impact.

SBC students persist into the second year of college at a rate that is 11 percent higher than that of non-coached students. The magnitude of the difference between the estimated persistence into the third year rates is even greater, at 21 percent (although this finding pertains only to students from the 2013 BPS graduating class). Though smaller in magnitude, the impacts on cumulative GPA,

semesters spent in good academic standing, and FAFSA renewals are not trivial, at 8, 10, and 9 percent increases, respectively.

In 2014-15, when the SBC students in the sample were in their first and second years of college, SBC coaches provided students with an average of four hours of one-on-one coaching, typically delivered through eight 30-minute in-person meetings. Additionally, SBC coaches interacted with students through emails and text messages during the year, which raises the average number of "touches" to 13. Considering the nine-month length of the academic year, this represents 1.4 interactions a month, on average. With this level of coaching intensity in mind, the impact results therefore support the value of sustained, proactive, responsive coaching support for students across a broad range of topics as they transition into and through the first two years of college.

5. How Are Impacts Related to Student Characteristics?

Overall, SBC has positive and significant impacts on measures of students' college persistence, academic achievement in college, and access to financial aid. This chapter explores how the average impacts on primary outcomes hold for particular subgroups of students. For example, SBC may have an impact on female students (and not on male students), or a differential impact as a function of enrollment in four- or two-year colleges. In statistical terms, specific student characteristics may *moderate* program impacts. This chapter examines how program impacts are related to four potential student moderators, listed in Exhibit 5-1.

Exhibit 5-1: Student Moderators and Subgroups

Moderator	Subgroups
Gender	Female
	Male
Underrepresented Minority Status	Underrepresented Minority
	Not Underrepresented Minority
High School Academic Achievement	High GPA
	Low GPA
Type of College	Two-year
	Four-year

Key Findings

The results from these exploratory analyses indicate that statistically significant positive impacts of SBC are concentrated within particular subgroups. Specifically, compared with their non-coached peers, SBC students who fall into one or more of the subgroups listed above have more-positive outcomes, as follows:

- Females have more-positive college persistence and achievement outcomes (than do non-coached female peers).
- Students not from racial/ethnic groups traditionally underrepresented in postsecondary education have a more positive financial aid outcome.
- Students first enrolled in four-year colleges have more-positive college persistence, achievement, and financial aid outcomes.
- Students who had high GPAs in high school have more-positive college achievement outcomes.

It is important to note that the impacts for many subgroups will differ in magnitude and statistical significance simply through random variation, even when true impacts do not differ across subgroups.

The results also suggest that certain student characteristics (i.e., gender and type of college) strengthen some SBC program impacts; in other words, some impacts are stronger for female students and those who first enrolled in four-year colleges. Specifically,

- Female SBC students had higher rates of persistence into the third year, and higher cumulative GPAs, than did male SBC students.

- SBC students who first enrolled in four-year colleges had higher rates of persistence into their third year, and they renewed their FAFSAs at a higher rate, than did SBC students who first enrolled in two-year colleges.

Findings within this chapter are organized according to three outcome domains: persistence, achievement, and financial aid. Within each outcome domain, we present results for the primary outcomes (see Appendix C for the full results of these analyses, including results for exploratory outcomes). These results are considered exploratory because they are based on subsets of the full sample; the smaller sample sizes mean the estimates are less precise and therefore limit our ability to detect statistical significance. Note that for these (and other) exploratory analyses, we do not apply corrections for multiple hypothesis tests.

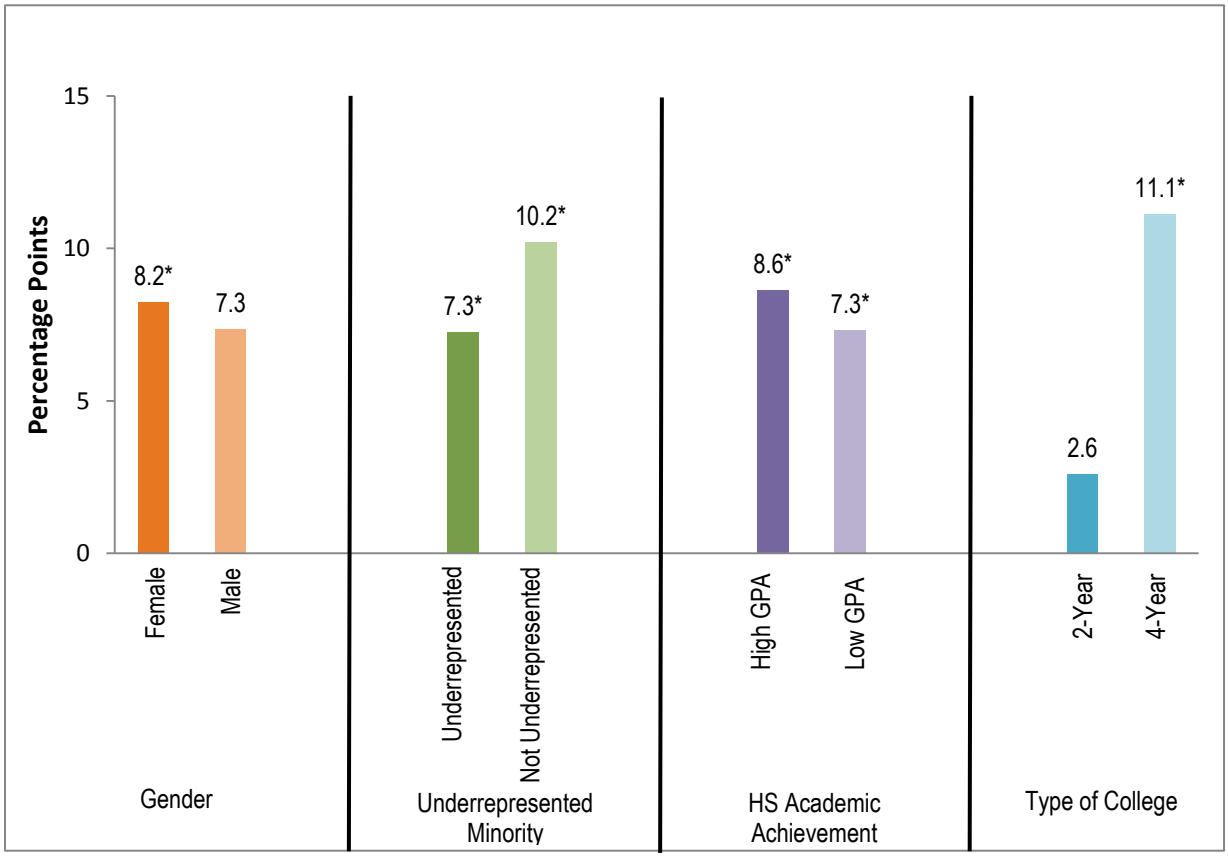
The exhibits in this chapter use asterisks (*) to indicate statistically significant impacts (where observed) for particular subgroups of students and the "†" symbol to indicate for which moderators (e.g., gender, college type) the subgroup effects vary statistically. For example, an asterisk (*) on female would indicate that SBC female students persisted at a rate is the statistically different from that of non-SBC female students, and the "†" symbol on the gender would indicate that the impacts of SBC on females is statistically different from that on males.

5.1 Persistence

Exhibit 5-2 (on page 46) displays the impact estimates of SBC on persistence into the *second* year of college as a function of key student characteristics. Female SBC students, as well as SBC students who first enrolled in four-year colleges, are more likely than comparison students to persist into their second year of college. Positive impacts of SBC on persistence into the second year are found for both underrepresented minority students and non-underrepresented minority students as well as for both higher and lower achieving students.

There is no statistically significant variation in impacts on persistence into the second year across gender, underrepresented minority status, high school academic achievement, or college type moderators. That is, the differences between the subgroup impacts within a given moderator are not statistically distinguishable from zero. For example, while the estimated impacts are larger for not underrepresented students than for underrepresented students, the impacts are not statistically different from each other. That is, the results suggest that coaching is not more effective at getting White and Asian/Pacific Islander students (i.e. those not underrepresented) to persist than it is for Black, Hispanic, Native American and Other/Multiracial students (i.e. those underrepresented). The same pattern holds for the other three moderators.

Exhibit 5-2: Impact of SBC on persistence into second year of college, by student characteristics

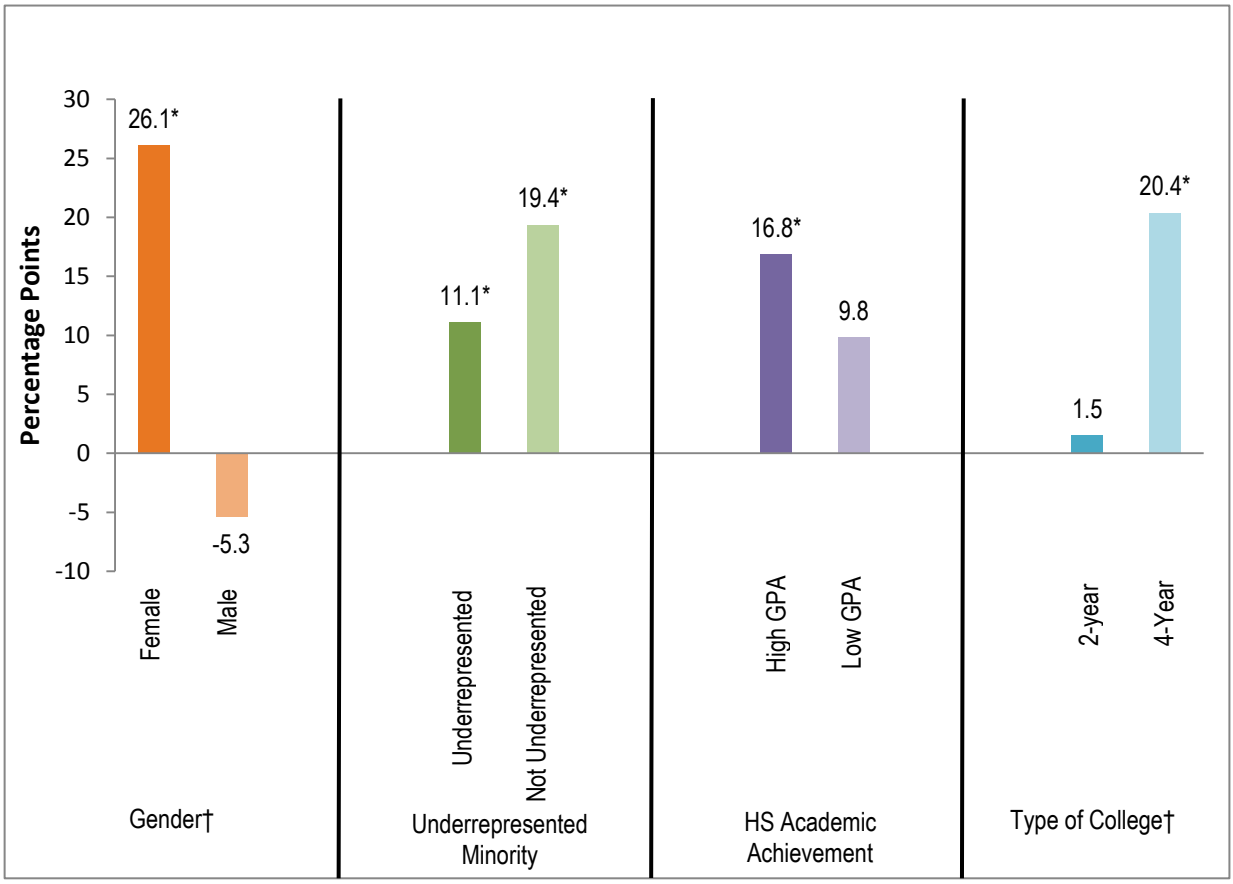


Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), and college administrative data
* Impact is significant on subgroup at the 5 percent level.
Exhibit Reads: There is a statistically significant impact of coaching on persistence into the second year of college for females, underrepresented minority students, non-underrepresented minority students, students with both high and low GPAs in high school, and students attending four-year colleges. There is no statistically significant variation detected in the impacts within any of the moderators.

The next exhibit, Exhibit 5-3 (on page 47), similarly presents impact estimates of SBC on persistence, this time examining persistence into the *third* year of college as a function of key student characteristics. The results are largely consistent with the second-year results; SBC students are more likely than comparison students to persist into their third year of college if they are female or if they first enrolled in a four-year college.

The results also suggest that the impacts of SBC on persistence into the third year are strengthened—that is, larger—for female students and students who first enrolled in a four-year college relative to male and two-year college students, respectively (as reflected by the "†" sign next to the moderator name). Gender and college type both moderate the impact of SBC on persistence into the third year. The impact of SBC on female students is statistically significant and larger than that on males (not statistically significant). Similarly, the impact of SBC on students first enrolling at a four-year college is statistically significant and larger than that on students first enrolling at a two-year college (not statistically significant).

Exhibit 5-3: Impact of SBC on persistence into third year of college, by student characteristics

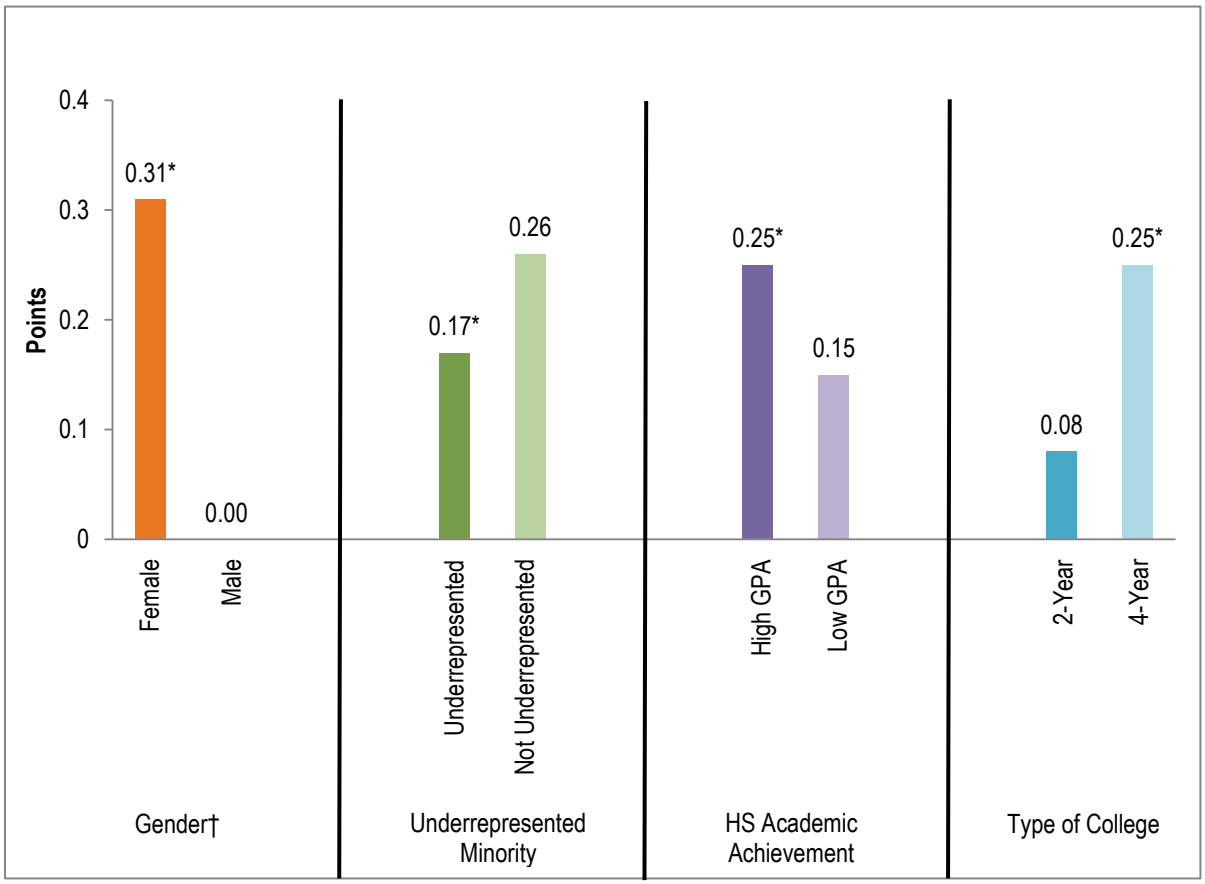


"Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), and college administrative data
* Impact is significant on subgroup at the 5 percent level.
† Moderator is significant at the 5 percent level.
Exhibit Reads: There is a statistically significant impact of coaching on persistence into the third year of college for females, students from underrepresented minorities, students not from underrepresented minorities, students with high GPAs in high school, and students attending four-year colleges. There is variation in the impacts of coaching on persistence into the third year of college by gender and the type of college attended.

5.2 Achievement

Exhibit 5-4 (on page 48) displays impact estimates of SBC on cumulative GPA by student characteristics, by comparing outcomes for SBC students and non-coached students. Impacts on cumulative GPA are concentrated within particular subgroups. Specifically, SBC students have higher cumulative GPAs than comparison students if they are female, from a traditionally underrepresented minority group, have high GPAs in high school, and first enrolled in a four-year college. Further, gender moderates the impact of SBC on students' cumulative GPAs, such that the impact of SBC on cumulative GPA is larger for female students than for male students.

Exhibit 5-4: Impact of SBC on cumulative GPA, by student characteristics

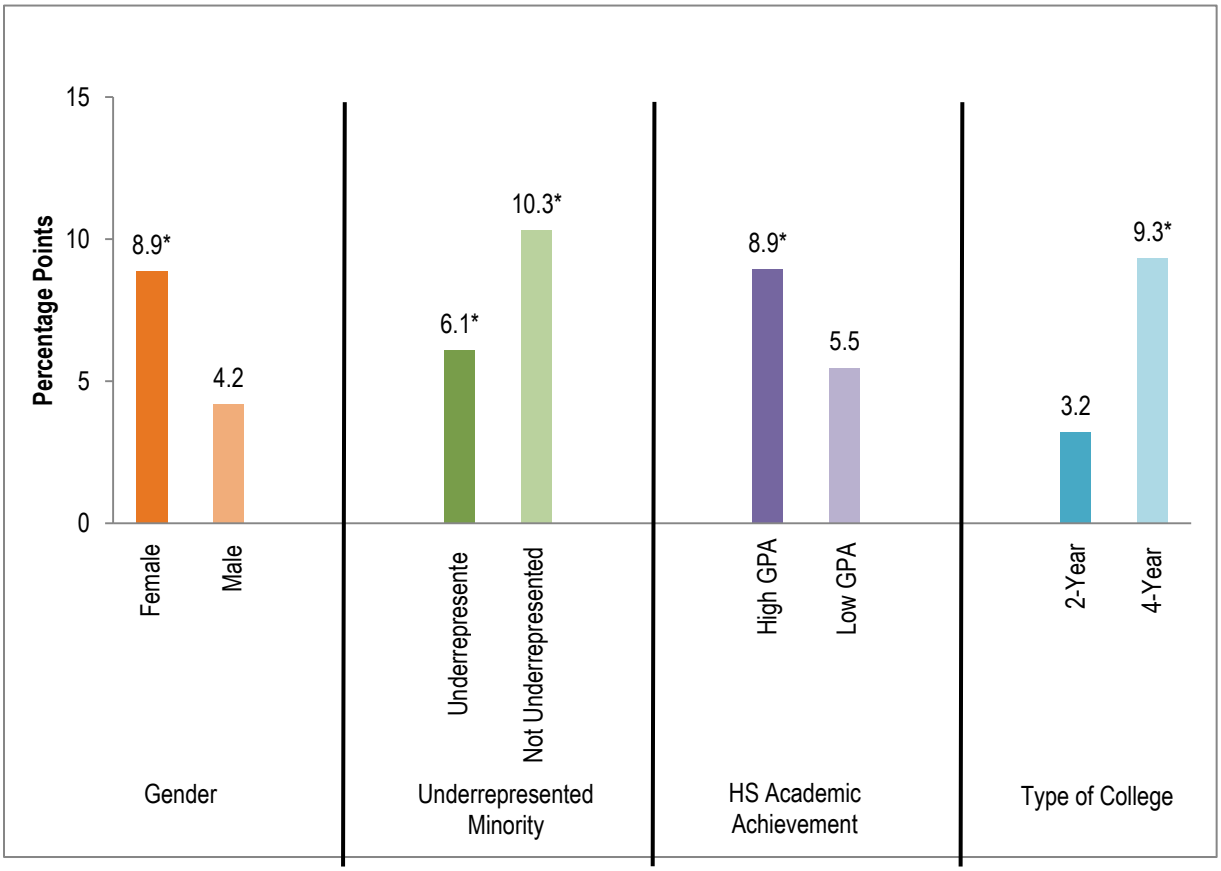


"Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), and college administrative data
* Impact is significant on subgroup at the 5 percent level.
† Moderator is significant at the 5 percent level.
Exhibit Reads: There is a statistically significant impact of coaching on cumulative college GPA for females, students from underrepresented minorities, students with high GPAs in high school, and students attending four-year colleges. There is variation in the impact of coaching on cumulative college GPA by gender.

Exhibit 5-5 (on page 49) similarly displays impact estimates of SBC on good academic standing as a function of student characteristics. Impacts on good academic standing are concentrated within particular subgroups; SBC students spend more semesters in good academic standing than comparison students if they are female, have high GPAs in high school, and first enrolled in a four-year college.

There is no statistically significant variation in impacts on good academic standing across gender, underrepresented minority status, high school academic achievement, or college type moderators. That is, the differences between the subgroup impacts (e.g., females versus males) within a given moderator (gender) are not statistically distinguishable from zero. Even if the impact on one subgroup (females) is statistically significant and the impact on the other subgroup (males) is not, the analysis may still not detect a statistically significant difference between the two impacts. This can happen because the impacts are not estimated with sufficient precision to claim they do not overlap; that is, because the confidence intervals between the two impact estimates overlap, the true impacts may be statistically indistinguishable.

Exhibit 5-5: Impact of SBC on good academic standing, by student characteristics



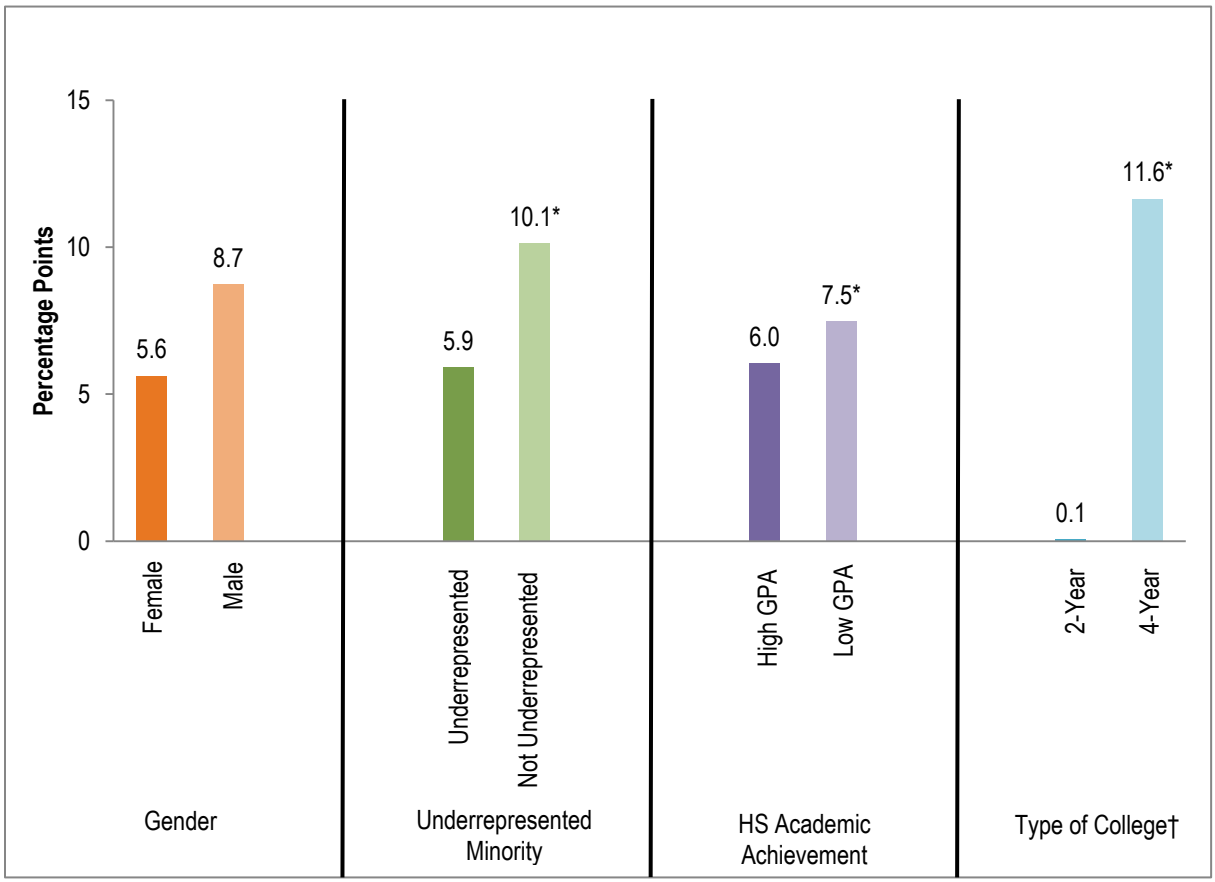
Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), and college administrative data
* Impact is significant on subgroup at the 5 percent level.
Exhibit Reads: There is a statistically significant impact of coaching on the percentage of semesters spent in good academic standing for females, students from underrepresented minorities, students not from underrepresented minorities, students with high GPAs in high school, and students attending four-year colleges. There is no variation in the impact of coaching on the percentage of semesters spent in good academic standing within any of the moderators.

5.3 Financial Aid

Exhibit 5-6 (on page 50) displays the impact estimates of SBC on FAFSA renewal for SBC students compared with non-coached students by student characteristics. Impacts on FAFSA renewal are concentrated within particular subgroups; specifically, SBC students renew their FAFSA at higher rates than comparison students if they are not from a traditionally underrepresented minority group, have low GPAs in high school, and first enrolled in a four-year college.

College type moderates the impact of SBC on students' cumulative GPAs, such that the impact of SBC on FAFSA renewal is larger for students who first enrolled in a four-year college than for students who first enrolled in a two-year college.

Exhibit 5-6: Impact SBC on FAFSA renewal, by student characteristics



Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), and college administrative data
* Impact is significant on subgroup at the 5 percent level.
† Moderator is significant at the 5 percent level.
Exhibit Reads: There is a statistically significant impact of coaching on FAFSA renewal rates for students not from underrepresented minorities, students with low GPAs in high school, and students attending four-year colleges. There is variation in the impact of coaching on FAFSA renewal by type of college attended.

5.4 Learning Points

An important question for the study is to understand not only whether SBC participation improves students' college-related outcomes, but for whom and under what conditions. This chapter explored this broad question by examining several different moderation analyses. The investigation provides suggestive evidence that, generally, SBC has positive impacts for:

- female students
- students from all racial/ethnic subgroups
- students with higher academic achievement in high school (as measured by GPA)
- students who first enrolled in four-year colleges.

Some student characteristics also *strengthen* the impact of SBC. Specifically, the impact of SBC on:

- persistence into the third year is larger for female students and students who first enrolled in four-year colleges
- cumulative GPA is larger for female students
- FAFSA renewal is larger for students who first enrolled in four-year colleges.

Taken together, these results indicate that there is indeed variation in program impact as a function of selected student characteristics. It may be helpful for SBC program staff to reflect on whether the transition supports provided, in particular, to male students and those students who first enrolled in two-year colleges merit closer examination.

6. How Are Impacts Related to Features of Coaching?

This chapter examines how features of coaching are related to the impacts of SBC. The analyses examine whether impacts are concentrated within students who experience more (or less) of a given feature. For example, does Success Boston Coaching have statistically significant impacts for students who have 10 or more coaching interactions—and for those who have fewer interactions with coaches? The analyses also examine to extent to which the impacts are moderated by particular features of coaching—that is, are the impacts *greater,* for example, when students experience more coaching interactions?

The chapter explores four coaching features: frequency of coach-student interactions, duration of one-on-one coach-student interactions, the nonprofit organization's score on the implementation index (described in more detail in the 2015 *Degrees of Coaching: Success Boston's Transition Coaching Model* report), and frequency of particular topics discussed during coach-student interactions. The exploratory analyses discussed in this chapter use the quasi-experimental approach described in Chapter 3, although the analytic models differ slightly, because information on features of coaching is available only for treatment students (those receiving SBC) and because the features of coaching may be related to program participation and outcomes.

Features of Coaching Moderators

- Frequency of Interactions
- Duration of One-on-One Interactions
- Implementation Index Score
- Frequency of Interactions in which Specific Topics Are Discussed:
  - Academic Topics
  - Financial Aid Topics
  - Managing Life Responsibilities
  - Career Topics

To simplify the analyses and ease the interpretation of the results, we transformed each continuous or categorical moderator into a binary variable representing two subgroups that differ by the value of that moderator, using the median value as the cut-point (e.g., one subgroup comprising students who experienced lower frequency of interactions, and the other comprising students who had more frequent interactions). We estimate separate impacts for the two subgroups, and then assess the magnitude and statistical significance of the *difference* between the subgroup-specific impact estimates.

These analyses are considered exploratory, both because they are based on subsets of the full sample and consequentially have less statistical power to detect differences than full-sample analyses, and because these coaching features are post-treatment measures that may reflect program impacts. For example, how often students choose to meet with their coaches may differ as a function of unobserved factors such as students' receptivity to coaching. Thus, the differences in effects for the corresponding subgroups may not be fully attributable to the features of coaching themselves.

Key Findings

The results from these exploratory analyses indicate that the impacts of coaching are concentrated among students who experience more frequent and longer coach interactions. Specifically, SBC students who experience 10 or more coaching interactions, more interactions addressing any of the

topic areas, and longer coach-student interactions (i.e., 27 or more minutes) have more-positive college outcomes than those of their peers not participating in SBC.

The results also suggest that greater exposure to some specific coaching features *strengthens* the impacts of SBC; in other words, the impacts are stronger for students who experienced more interactions and interactions that cover certain topics. Specifically,

- Students who experience more coach-student interactions have higher rates of persistence into the third year of college and more semesters in good academic standing than have students who experience fewer interactions.
- Students who have more exposure to academic topics during coaching interactions spend more semesters in good academic standing.
- Students who have more exposure to financial aid topics during coaching interactions are more likely to persist into the second and third years, have higher cumulative GPAs, and spend more semesters in good academic standing than have students with less exposure to financial aid topics.
- Students who have more exposure to career topics during coaching interactions are more likely to persist into the second year, have higher cumulative GPAs, and spend more semesters in good academic standing.

Findings within this chapter are organized according to three outcome domains: persistence, achievement, and financial aid. Within each outcome domain, we present results for the primary outcomes (see Appendix C for the full results of these analyses, including results for exploratory outcomes). Note that for these (and other) exploratory analyses, we do not apply corrections for multiple hypothesis tests.

Following the conventions in Chapter 5, we use asterisks (*) to indicate statistically significant impacts (where observed) for particular subgroups of students and the "†" symbol to indicate for which moderators (e.g., frequency, duration) subgroup effects vary statistically.

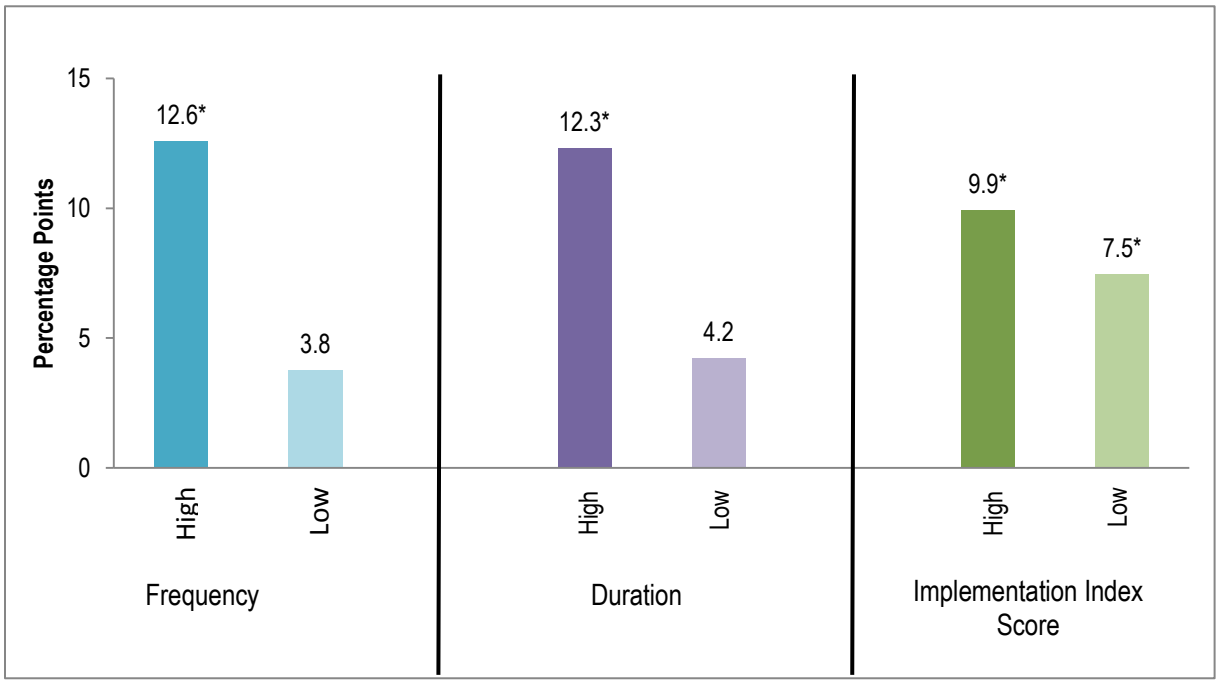
6.1 Persistence

Exhibits 6-1 and 6-2 (on pages 55 and 55) display the impact estimates on second-year persistence for SBC students compared with non-coached students, by features of coaching experienced by SBC students. SBC students are more likely than comparison students to persist into their second year of college if they experience:

- higher numbers of coach-student interactions overall
- higher numbers of coach-student interactions that cover academic, financial aid, and career topics
- longer one-on-one coach-student interactions.

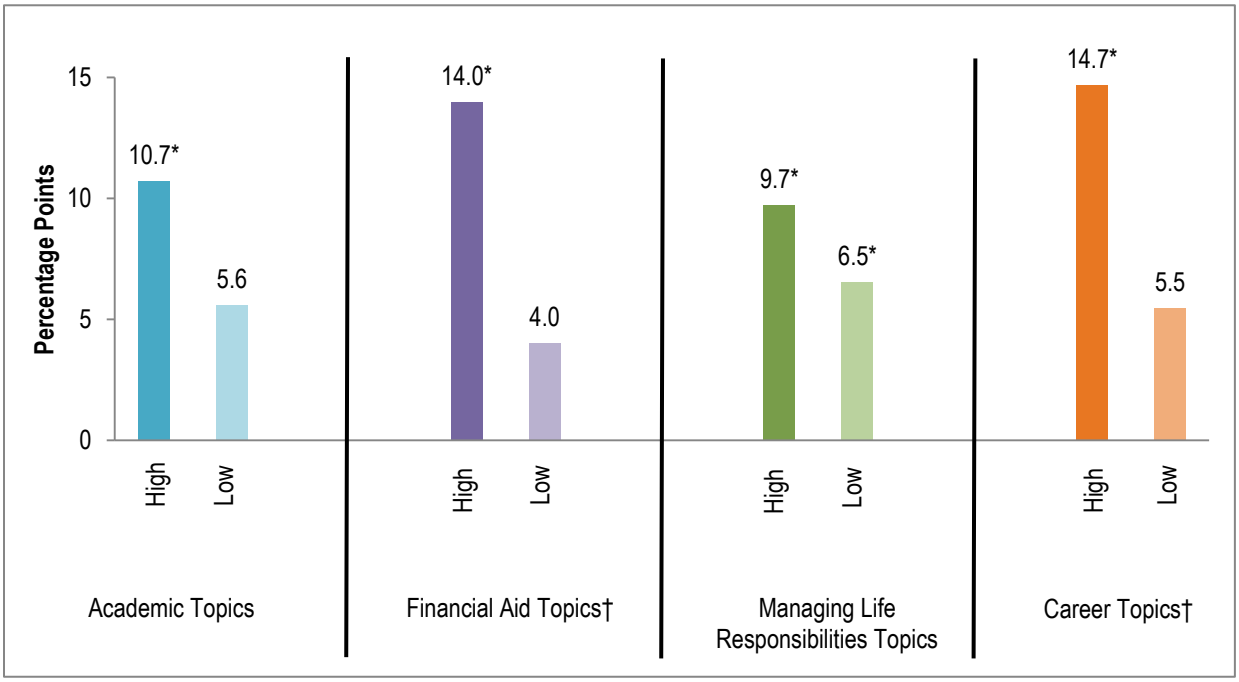
The results also suggest that the impacts of SBC on persistence into the second year are strengthened—that is, larger—for students who experience more interactions that address financial aid and career topics than the SBC impacts for students who experience fewer interactions.

Exhibit 6-1: Impact of SBC on persistence into the second year of college, by frequency and duration of coach-student interactions and implementation index score



Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE); college administrative data; and Program database data collected from the coaching organizations
* Impact is significant on subgroup at the 5 percent level.
Exhibit Reads: There are statistically significant impacts of coaching on persistence into the second year of college for students in the high frequency of interactions subgroup, those in the high duration of one-on-one interactions subgroup, and for students coached by nonprofit organizations with both high and low implementation index scores.

Exhibit 6-2: Impact of SBC on persistence into the second year of college, by frequency of topics addressed during coaching interactions



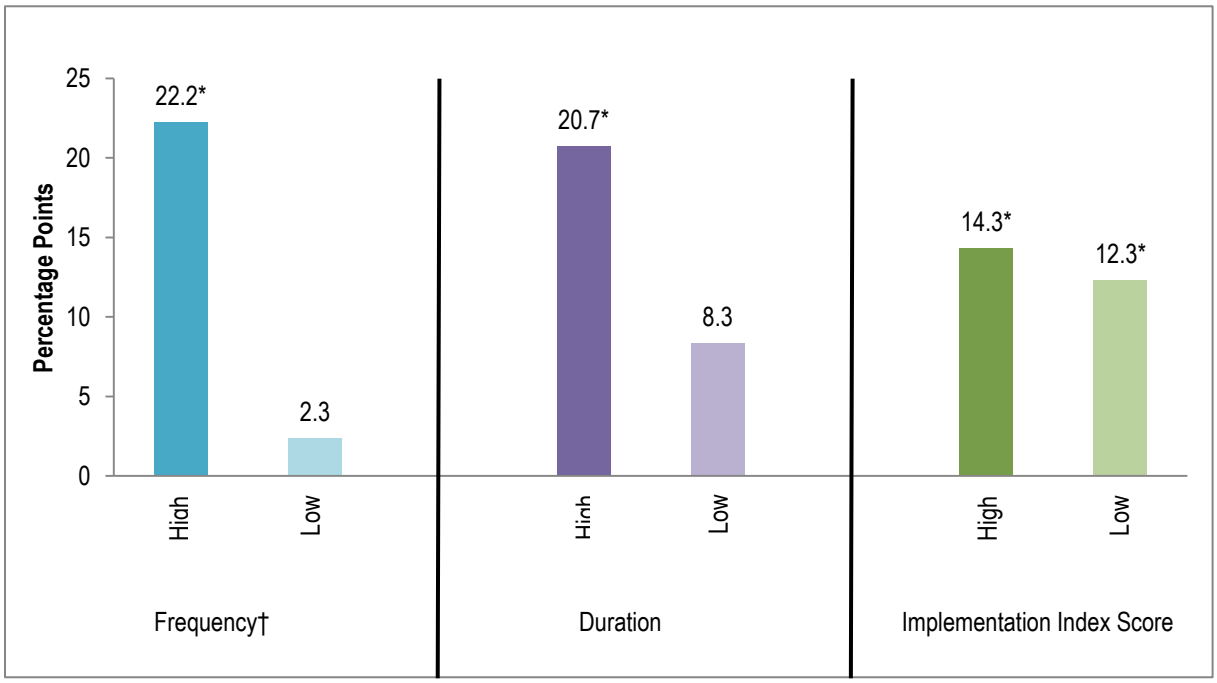
Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE); college administrative data; and Program database data collected from the coaching organizations
* Impact is significant on subgroup at the 5 percent level.
† Moderator is significant at the 5 percent level.
Exhibit Reads: Across the topic areas, there is a statistically significant impact of coaching on persistence into the second year of college for students who experienced more interactions that covered the given topic (students in the "high" subgroups). There is also a statistically significant impact for students who experienced fewer interactions covering managing life responsibilities. There is variation in the impact of coaching on persistence into the second year by interactions focusing on both financial aid and career topics.

Exhibits 6-3 and 6-4 (on pages 57 and 57) display the impact estimates on third-year persistence for SBC students compared with students who did not participate in SBC, by features of how SBC students experience coaching. SBC students are more likely than comparison students to persist into their third year of college if they experience:

- more coach interactions overall
- more coach interactions that cover financial aid and managing life responsibilities topics
- longer one-on-one coach-student interactions.

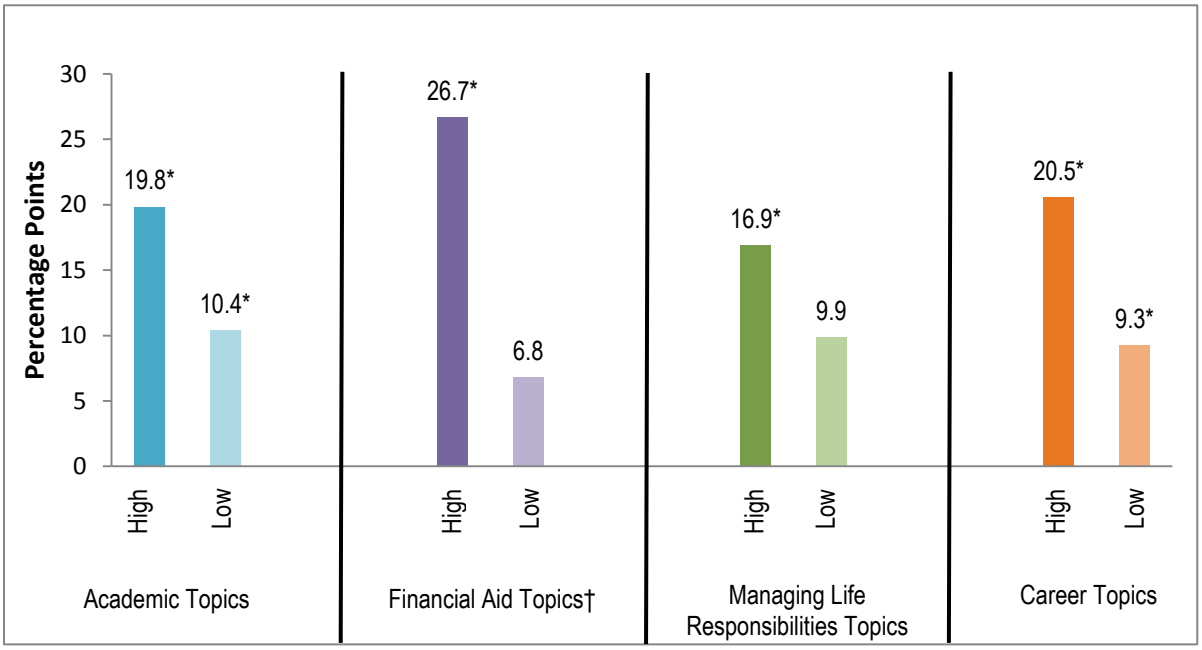
The results also suggest that the impacts of SBC on persistence into the third year are stronger for students who experience both more interactions and interactions that cover financial aid topics, than the SBC impacts for students who experience fewer interactions and fewer interactions about financial aid.

Exhibit 6-3: Impact of SBC on persistence into the third year of college, by frequency and duration of coach-student interactions and implementation index score



Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE); college administrative data; and Program database data collected from the coaching organizations
* Impact is significant on subgroup at the 5 percent level.
† Moderator is significant at the 5 percent level.
Exhibit Reads: There are statistically significant impacts of coaching on persistence into the third year of college for students in the high frequency of interactions subgroup, those in the high duration of one-on-one interactions subgroup, and for students coached by nonprofit organizations with both high and low implementation index scores.

Exhibit 6-4: Impact of SBC on persistence into the third year of college, by frequency of topics addressed during coaching interactions



Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE); college administrative data; and Program database data collected from the coaching organizations
* Impact is significant on subgroup at the 5 percent level.
† Moderator is significant at the 5 percent level.
Exhibit Reads: Across the topic areas, there is a statistically significant impact of coaching on persistence into the third year for students who experience more interactions that covered the given topic (students in the "high" subgroups). There is also a statistically significant impact for students who experienced fewer interactions covering financial aid. There is variation in the impact of coaching on persistence into the third year by interactions focusing on financial aid topics.

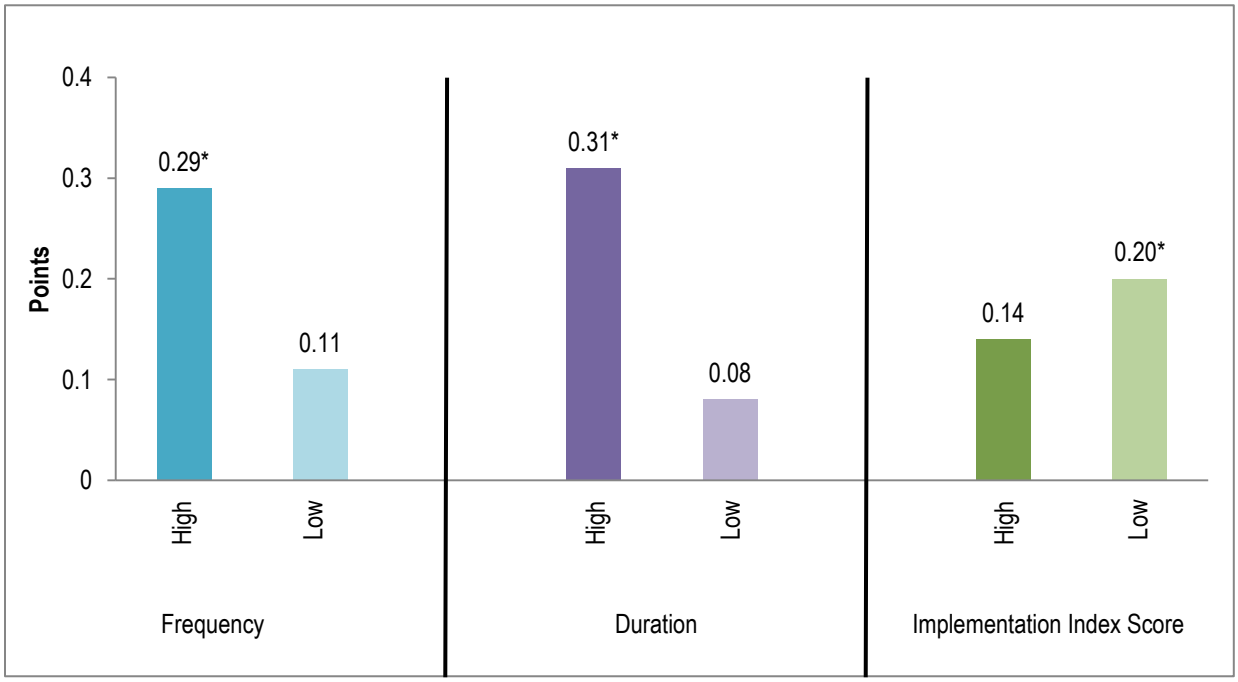
6.2 Achievement

Exhibits 6-5 and 6-6 (on pages 59 and 59) display the impact estimates on cumulative college GPA for SBC students compared with students who did not participate in SBC, by features of how SBC students experience coaching. SBC students are more likely than comparison students to achieve higher cumulative GPAs if they experience:

- more coach interactions overall
- more coach interactions that cover academic, financial aid, and career topics
- longer one-on-one coach-student interactions
- coaching from a nonprofit organization with a lower score on the implementation index.

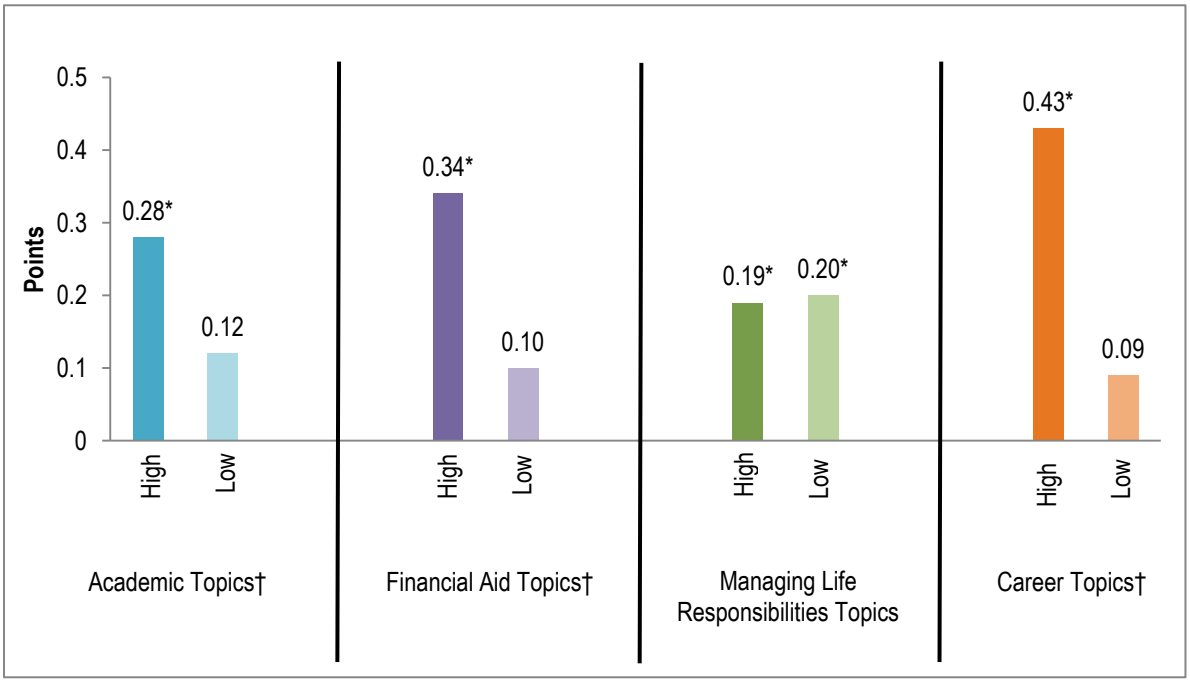
The results also suggest that the impacts of SBC on cumulative GPA are stronger for students who experience more interactions that cover financial aid and career topics than SBC impacts for students who experience fewer interactions covering those topics.

Exhibit 6-5: Impact of SBC on cumulative GPA, by frequency and duration of coach-student interactions and implementation index score



Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE); college administrative data; and Program database data collected from the coaching organizations
* Impact is significant on subgroup at the 5 percent level.
Exhibit Reads: There are statistically significant impacts of coaching on cumulative GPA for students in the high frequency of interactions subgroup, those in the high duration of one-on-one interactions subgroup, and for students whose coaches were from nonprofit organizations with lower implementation index scores.

Exhibit 6-6: Impact of SBC on cumulative GPA, by frequency of topics addressed during coaching interactions



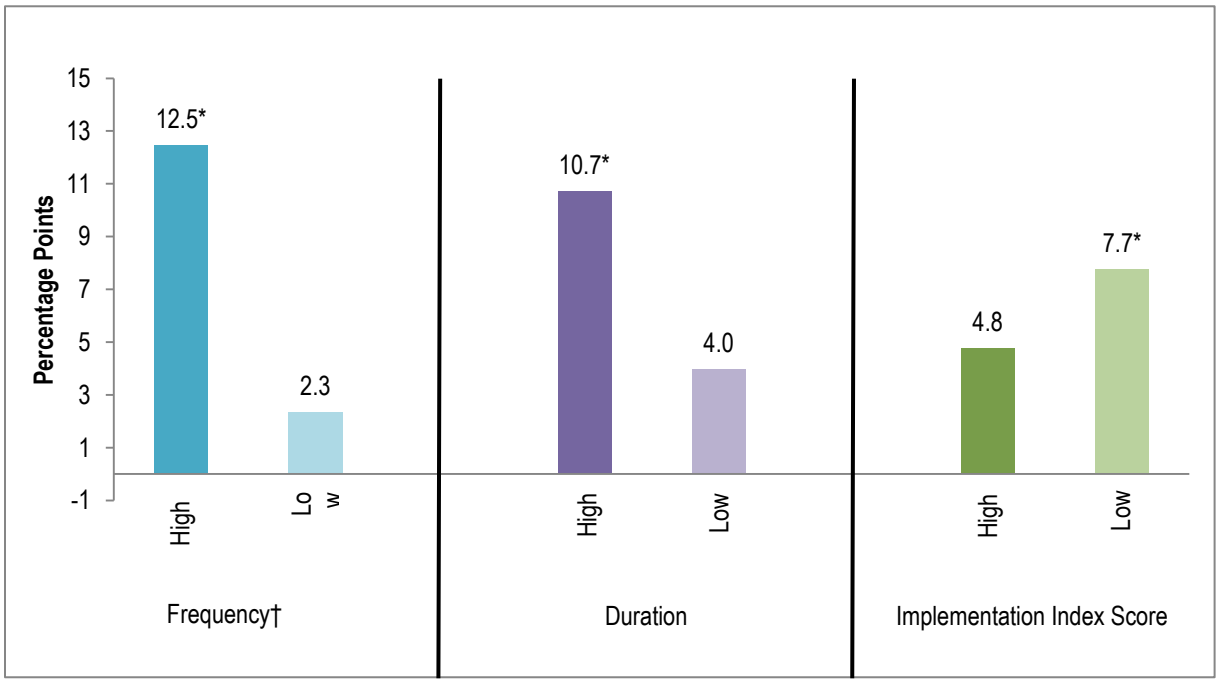
Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE); college administrative data; and Program database data collected from the coaching organizations
* Impact is significant on subgroup at the 5 percent level.
† Moderator is significant at the 5 percent level.
Exhibit Reads: For each topic area, there is a statistically significant impact of SBC on cumulative GPA for SBC students who experience more interactions on the given topic. There is also a statistically significant impact for students who experience fewer interactions covering managing life responsibilities. There is variation in the impact of coaching on cumulative GPA by interactions focusing on academics, financial aid, and career topics.

Exhibits 6-7 and 6-8 (on pages 61 and 61) display the impact estimates on semesters spent in good academic standing for SBC students compared with non-coached students, by features of how SBC students experience coaching. SBC students are more likely than comparison students to spend more semesters in good academic standing if they experience:

- more coach interactions overall
- more coach interactions that cover academics, financial aid, managing of life responsibilities, and career topics
- longer one-on-one coach-student interactions
- coaching from nonprofit organizations with lower scores on the implementation index.

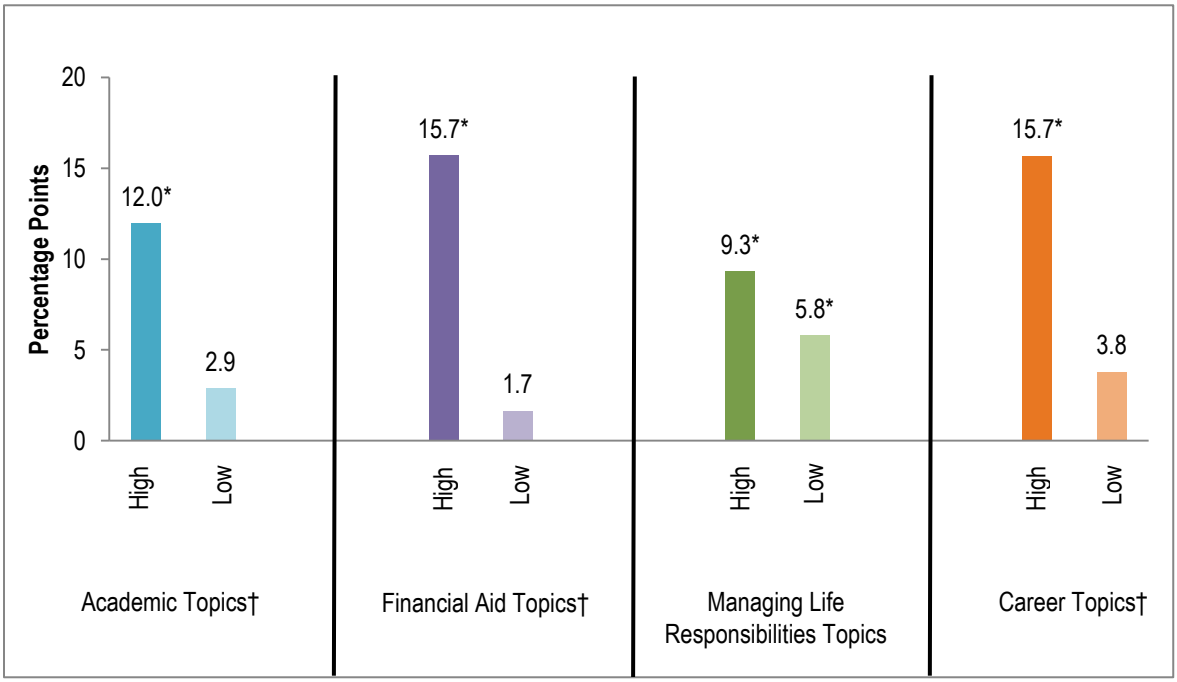
The results also suggest that the impacts of SBC on semesters spent in good academic standing are stronger for students who experience more rather than fewer interactions and interactions that cover academic, financial aid, and career topics

Exhibit 6-7: Impact of SBC on good academic standing, by frequency and duration of coach-student interactions and implementation index score



Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE); college administrative data; and Program database data collected from the coaching organizations
* Impact is significant on subgroup at the 5 percent level.
† Moderator is significant at the 5 percent level.
Exhibit Reads: There are statistically significant impacts of coaching on the number of semesters spent in good academic standing for students in the high frequency of interactions subgroup, those in the high duration of one-on-one interactions subgroup, and for students coached by nonprofit organizations with lower implementation index scores.

Exhibit 6-8: Impact of SBC on good academic standing, by frequency of topics addressed during coaching interactions



Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE); college administrative data; and Program database data collected from the coaching organizations
* Impact is significant on subgroup at the 5 percent level.
† Moderator is significant at the 5 percent level.
Exhibit Reads: Across the topic areas, there is a statistically significant impact of coaching on the percentage of semesters spent in good academic standing for students who experience more interactions that covered the given topic (for students in the "high" subgroups). There is variation in the impact of coaching on the percentage of semesters spent in good academic standing by interactions focusing on academics, financial aid, and career topics.

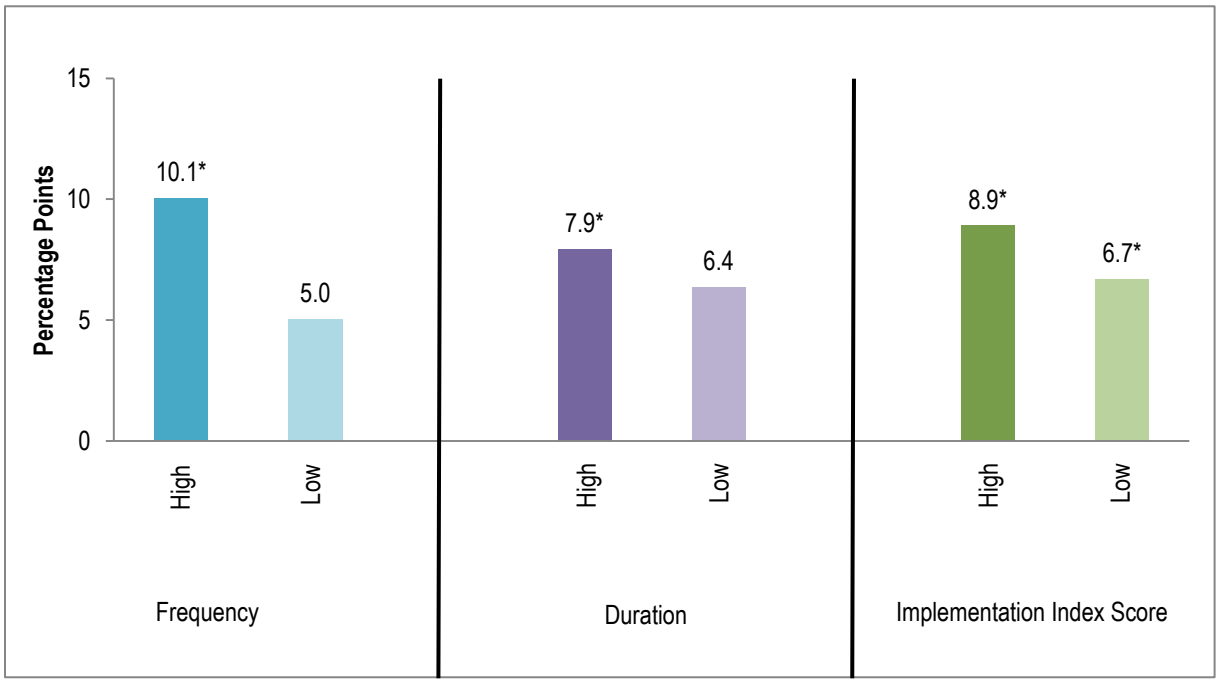
6.3 Financial Aid

Exhibits 6.9 and 6.10 (on pages 63 and 63) display the impact estimates on FAFSA renewal for SBC students compared with students who did not participate in SBC, by features of how SBC students experience coaching. SBC students are more likely than comparison students to renew their FAFSAs if they experience:

- more coach interactions overall
- more coach interactions that cover financial aid and fewer that cover managing life responsibilities
- longer one-on-one coach-student interactions.

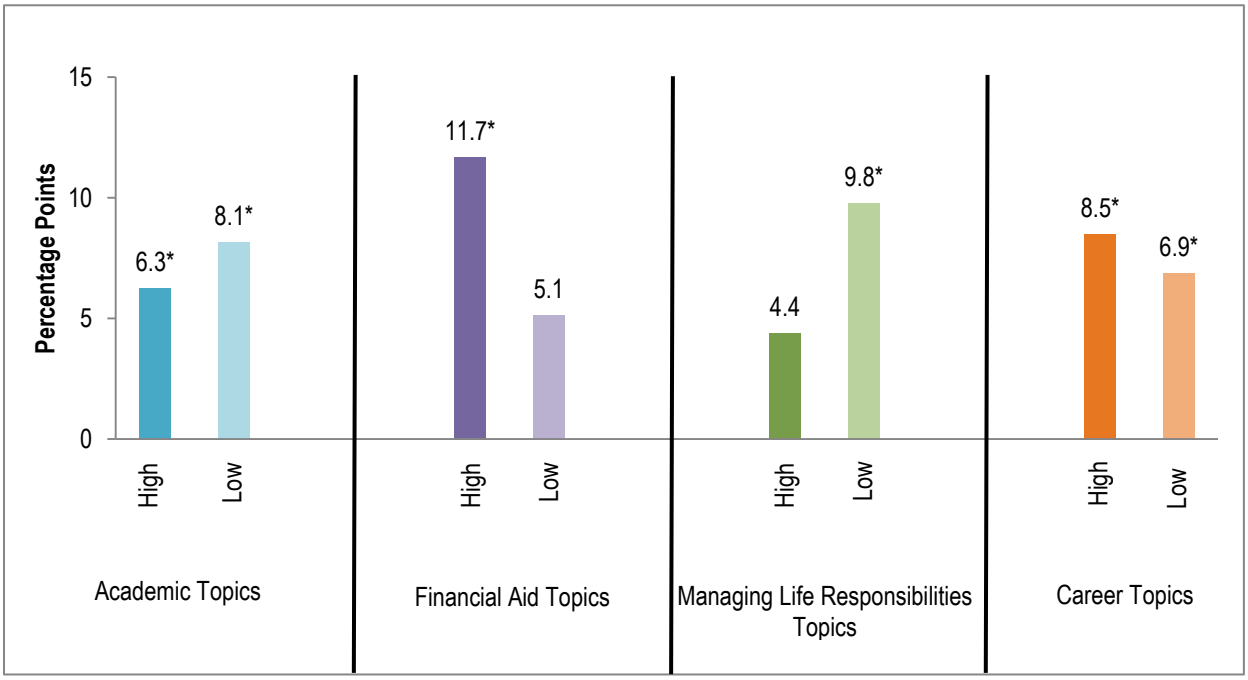
The impacts on FAFSA renewal do not vary across any of the coaching feature moderators. That is, there are no statistically significant differences in the impact of SBC on FAFSA renewal within any of the moderators.

Exhibit 6-9: Impact of SBC on FAFSA renewal, by frequency and duration of coach-student interactions and implementation index score



Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE); college administrative data; and Program database data collected from the coaching organizations
* Impact is significant on subgroup at the 5 percent level.
Exhibit Reads: There are statistically significant impacts of coaching on FAFSA renewal for students in the high frequency of interactions subgroup, those in the high duration of one-on-one interactions subgroup, and for students coached by nonprofit organizations with both high and low implementation index scores.

Exhibit 6-10: Impact of SBC on FAFSA renewal, by frequency of topics addressed during coaching interactions



Sources: National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE); college administrative data; and Program database data collected from the coaching organizations
* Impact is significant on subgroup at the 5 percent level.
Exhibit Reads: Across the topic areas, there is a statistically significant impact of coaching on FAFSA renewal for students who experience more interactions that cover the given topic (students in the "high" subgroups). There are also statistically significant impacts for students who experience fewer interactions covering academic and career topics. There is no variation in the impact of coaching on FAFSA renewal by any of the focus areas.

6.4 Learning Points

Taken together, the results from examining variation in the effects of SBC and how the program affects particular student subgroups (as defined by their coaching experiences) can inform decisions about program implementation—specifically, about practices that seem to be more consistently related to positive student outcomes. The results presented in this chapter provide suggestive evidence that the impacts of SBC coaching do vary across particular features of coaching. They also point to some programmatic features that could be further enhanced and could potentially be provided to students across coaches and nonprofit organizations.

One important takeaway about these findings is that for some—but not all—outcomes, *more* SBC coaching is better. SBC students with higher numbers of coaching interactions experience larger program impacts on persistence into the third year of college and on number of semesters spent in good academic standing than do SBC students who experience fewer interactions. Similarly, SBC students with higher numbers of coaching interactions that cover financial aid or career topics experience larger program impacts on persistence and achievement outcomes than do those SBC students who experience fewer interactions covering these topics.

The results, based on a series of exploratory moderation analyses, suggest that how students experience coaching is related to impacts. Generally, SBC has large positive impacts across the primary outcomes on students in the subgroups experiencing more coaching, more interactions addressing any given topic, and longer one-on-one coach-student interactions.

7. Discussion

Success Boston Coaching provides a multi-faceted resource to participating students, including many supports that, individually, have been found to improve outcomes for college-entering students. The supports provided through SBC include knowledge of the college, relationship building, support with logistics, nudges and reminders to complete time-sensitive tasks, proactive outreach, meeting students where they are, time management skills, developing self-sufficiency, and providing social-emotional supports (Bettinger and Baker 2014; Carrell and Sacerdote 2013; Castleman, Arnold, and Wartman 2012; Castleman, Page, and Schooley 2014; Avery, Howell, and Page 2014; Scrivener and Weiss 2009; Stephan and Rosenbaum 2013).

Perhaps uniquely so, the SBC intervention integrates these different features into a single intervention, and as demonstrated in earlier chapters of this report, it has positive effects on students across multiple early college outcomes. SBC improves students' outcomes across all three outcome domains examined (persistence, achievement, and financial aid), and it has positive impacts on students from all racial/ethnic groups and across the continuum of high school GPA averages.

Summary of SBC Program Impacts

Success Boston Coaching demonstrated significant program impacts on the following eight student outcomes:

- **Persistence into second year of college**
- **Persistence into third year of college**
- Continuous enrollment
- Full-time status
- **Cumulative GPA**
- **Good academic standing**
- Credit accumulation
- **FAFSA renewal**

(bold indicates primary outcomes)

The magnitude of the SBC impacts is generally comparable to those reported about other similar programs targeting improved college student outcomes (see Bettinger and Baker 2014; Castleman and Page 2015; Oreopoulos and Petronijevic 2016). These other studies have observed effects on college persistence and achievement equivalent to about 10-15 percent increases over the control group means. The estimated impact of SBC on persistence into the third year[22], however, is larger than typically seen in the literature. Overall, the effects of SBC can be characterized as positive and large.

The 2015 SBC implementation report documents the intensity of coaching, showing that SBC coaches provided students with an average of four hours of one-on-one coaching, typically delivered through eight 30-minute in-person meetings. Additionally, coaches interacted with students via email and text message, corresponding to approximately 1.4 interactions a month over the academic year. The impact results suggest that the SBC model has meaningful and significant promise. A model in which professional coaches deliver sustained, proactive, and responsive support within a larger education network may not necessarily need to be "high touch" to accomplish the overarching program goal: to move more students more quickly and effectively along the pathway to college completion.

[22] Recall that this outcome is measured only for the fall 2013 cohort.

Grouping SBC students by how they experience coaching (e.g., frequency of interactions, range of topics addressed, and duration of one-on-one interactions), as well as according to their respective nonprofit organization's implementation index score, allows this evaluation to investigate impacts by features of coaching. This analysis provides some evidence that the impacts of coaching vary in important ways: there are statistically significant impacts on students who experience more coaching interactions overall, more interactions that cover financial aid topics, and longer one-on-one interactions across all primary outcomes.

The exploratory analyses also indicate that impacts vary across particular features of coaching; SBC has larger impacts on students who experience more, compared to fewer, interactions and more interactions spanning academic, financial aid, and career topics. These features of coaching may moderate some of the impacts such that coaching has a stronger effect when students experience 10 or more interactions during the year, or at least once a month during a typical academic year, and when those interactions span academic, financial aid, and career topics.

The research literature describing other interventions that support students' transition to college generally provides more information on program impacts and less on program implementation; consequently, it is difficult to assess similarities or differences between SBC and these other programs, particularly in terms of dosage (e.g., Bettinger and Baker 2014; Castleman and Page 2015; Castleman, Page, and Schooley 2014; Oreopoulos and Petronijevic 2016; Visher, Butcher, and Cerna 2010).

What is clear is that college transition interventions can lead to positive outcomes for students, if they offer (1) proactive and sustained outreach to students over three-plus months, and (2) adaptive responses to students' individual questions and challenges.

Limitations

This evaluation uses a quasi-experimental research design to estimate the effects of SBC on various student outcomes. Methodological research about within-study comparisons suggests that such designs can generate causal impact estimates and can approximate results from randomized control trials. The analyses reported here have been informed by such methodological research. Nevertheless, we should note that there could be confounding factors not fully accounted for by the local and focal matching strategy this evaluation employed, because such factors are not observable or are measured with error or with proxies. To the extent that the impacts reflect, in part, the influence of unmeasured individual student characteristics on both participation in coaching and outcomes in college, the matched comparison group does not eliminate bias that a random assignment process generally does.

Nonetheless, the SBC recruitment processes and the sample construction each help reduce the likelihood of confounding factors. Students are recruited in SBC through a variety of avenues: referrals from high school guidance counselors and other community organizations, nonprofit organizations' middle school and high school programming pipelines, word of mouth, and sometimes from college referrals. Such recruitment pathways combine to create successive cohorts of SBC students who differ with respect to levels of motivation, attachments to the nonprofit organizations, and willingness to seek support. Also, the sample was constructed using the most inclusive definition of an SBC student. Specifically, for the purposes of the evaluation, all students initially recruited into the SBC program and who appeared in the program database—including those few without a single recorded interaction with a coach—are considered SBC students. Therefore, the analytic sample

includes students who may have had second thoughts about participating in SBC and those with lower predispositions to take up the supports SBC offers.

It is also important to note that one of the key goals of the Success Boston initiative is to demonstrate that transition coaching can meaningfully improve students' college-related outcomes, and it may be the case that partner colleges alter the services they offer incoming students. The findings reported here reflect impacts observed for students in college during the 2013-14 and 2014-15 academic years (and on college enrollment in 2015-16 just for the BPS class of 2013). Should student support services similar to those provided by the Success Boson Coaching nonprofit organizations *increase* in partner colleges, it is possible that the contrast between Success Boston–coached students and the comparison students would diminish for later cohorts.

Future Steps

The results reported here demonstrate that SBC is having the desired effects on students from Boston. SBC participants are persisting longer, achieving higher academic progress, and taking the necessary steps to maintain funding for college—all good signs of progress toward college completion. However, the low number of credits accumulated toward graduation, particularly for students at two-year colleges, may be cause for concern. The study will continue to monitor students' progress over the next several years, culminating in a 2020 report describing impacts once these students have had the opportunity to complete five and six years of college. That report will help address questions about whether the positive impacts of coaching reported here persist, and whether Success Boston has made more progress toward its goal of having at least 70 percent of BPS college entrants earn college credentials.

Appendix A. Propensity Score Matching Process

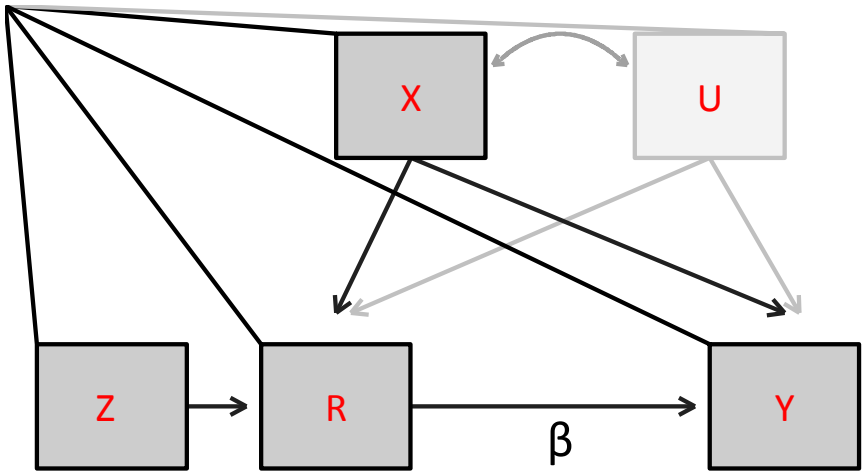
A simple comparison of the postsecondary outcomes of BPS students who receive SBC coaching versus BPS students who did not receive SBC coaching would likely provide a misleading picture of the effect of the SBC coaching program, because such a comparison would not take key information into account. First, these two types of students may have different individual and family characteristics, such as academic achievement (test scores) or parental involvement, which may be directly related both to differences in their interest in participating in the SBC coaching program and to their postsecondary outcomes. We refer to characteristics that affect both selection into the program and postsecondary outcomes as *confounding factors*, and these specific types of characteristics as *individual self-selection factors*.

A second type of confounding factor can arise when both participating and non-participating students are from BPS, but may have been raised in different neighborhoods and had different high school experiences. For instance, some coaching recipients may have had less academic support during high school, and that lack of support may have led them to seek help from an external organization. We refer to such confounders as *historical and locational factors*.

Another complication for the comparison of SBC and non-SBC students is that they may enroll in different colleges, which means exposure to such college-specific factors as selectivity of the institutions, quality of faculty and instruction, and peers' motivation and performance—any of which might influence their outcomes in different ways. These are not confounders by definition (because they are observed *after* selection into coaching and they could not have determined whether a student participates in SBC or not), but they could still bias the estimated effects of SBC unless they are accounted for. Unlike the first two types of confounders, the influence of these college-specific factors occurs *at the same time* as the SBC coaching program is providing services; therefore, we refer to these as *contemporaneous sources of bias.*

Exhibit A-1 shows a stylized causal diagram of the nature of a set of confounders X, which affect both the receipt of coaching (receipt of treatment) R and the outcome Y, when we want to measure the direct impact of R on Y (denoted as β).

Exhibit A-1: Stylized causal diagram



If there are other confounders that are unobserved (U), the correction for bias in estimates of the effect β resulting from adjusting for X may be incomplete. One might also use factors such as Z that influence receipt of coaching R but have no direct impact on the outcome Y, called *excluded instruments*, in an instrumental variables (IV) estimator. But in many cases, an IV estimator relying on factors Z will have unacceptably high variance, on top of which it is very hard to claim with confidence that any observed variable satisfies both of these requirements (that is, influence R but have no direct impact on Y) unless it is randomly assigned.

Ideally, we would like to randomly assign R; but in the absence of random assignment, we wish to adjust for as many factors in X as we can, and hope that variables in U either have small correlations with R and Y, or that they are highly correlated with X so that adjusting for X eliminates bias due to confounders U, as well.

Given that is was not feasible to conduct an experimental design (or randomized control trial) that would yield two groups of students balanced on all observable and unobservable confounders, we use a quasi-experimental design that (1) compares SBC students with a comparison group of similar students and (2) can account for as many of the observable confounders as possible. Guided by the current methodological research on best quasi-experimental design practices, we constructed such a comparison group using a matching process that had two features:[23] matches were *local* (the comparison cases drawn from the same settings as the treatment cases to the extent possible) and also *focal* (matching was done using baseline characteristics that we believed to predict both selection into treatment and the outcome).

For this evaluation, we developed a quasi-experimental design using local and focal matching; we match each SBC student with at least one and possibly multiple non-SBC students from the same cohort, graduated from high schools with similar characteristics, and enrolled in the same college (local matching), who also share similar baseline characteristics that are empirically linked to our outcomes of interest and also potentially to receipt of SBC coaching (focal matching). Given the large number of matching characteristics, we implemented matching using estimated propensity scores. These scores represent the conditional probability of getting SBC coaching (given covariates), thereby incorporating all the relevant influence of the confounders on selection into treatment in one variable.[24] The assumption then is that factors Z affect receipt of coaching R conditional on X, but we

---

[23] Within-study comparisons (or design replication studies) examine quasi-experimental designs by replacing the randomly determined control group in an experiment with comparison groups constructed from units that did not participate in the original experiment using different quasi-experimental methods. Such studies compare the impact estimates yielded by these additional comparison groups with the experimental impact estimates, and try to generalize the specific features of the results yielded by quasi-experimental designs that replicate (or come closest) to the experimental results. Results of several well designed within-study comparisons suggest that matching methods are promising, and the results replicated experimental benchmarks (Bifulco 2012; Clair, Cook, and Hallberg 2014; Steiner, Cook, and Shadish 2011), especially when pretreatment variables matched on are analogous to key outcomes (Smith and Todd 2005).

[24] One way to conduct matching is to form matched pairs that have the same baseline characteristics, which is also known as *exact matching*. Though this approach may be desirable, it becomes infeasible as the number of baseline variables used in the matching increases. This "curse of dimensionality" problem is solved by performing the matching on a function of the baseline variables instead of targeting exact matches on all

need not observe Z. For example, some students may, through happenstance, hear about coaching and become more open to participating, and these students will be more likely to participate, even conditional on all X variables or the propensity score that captures the influence of X variables.

The next section of the appendix describes the matching process and construction of the comparison group in detail. Section A.1 explains our local and focal matching approach in more depth, Section A.2 presents how the propensity scores were estimated, Section A.3 provides details on the matching process, and Section A.4 shows how we assessed the quality of the matches.

A.1 Implementation of Local and Focal Matching

Local Matching

The postsecondary outcomes of interest for this evaluation (including persistence in college and eventually, attainment of a postsecondary credential) are directly dependent on the extent to which students' high schools prepared them for college-level coursework, the difficulty of coursework, accessibility of student support at different colleges, and students' interactions with college teaching staff, administrators, and peers. Therefore, in this context, "local matching" would ideally be implemented by matching SBC students with non-SBC students who both attended the same college and graduated from the same high school in the same year (i.e., the matching process would be conducted separately, using "matching blocks" of unique combinations of high school, college, and cohort groups). Matching on high school attempts to account for historical and locational differences between the SBC and non-SBC students, whereas matching on college controls for contemporaneous sources of bias, which are defined as college-related factors that are independent of the SBC program, differ across colleges, and potentially affect outcomes of interest (e.g., difficulty of coursework). Finally, matching on SBC cohort would account for differences in the overall characteristics of each cohort and the potential differences in the selection processes employed by the coaching organizations and changes in the college-related factors from one year to the next.

Unfortunately, small cell sizes made exact matching on high schools and colleges untenable: in a number of high school/college combinations, there are no potential comparison students with whom treatment students might be matched; in other combinations, there are only one or two comparison students for many treatment students. Given our focus on postsecondary outcomes, we tried to address this problem by privileging students' postsecondary institutions as our primary matching block and pooling high schools into groups of schools with similar characteristics.

This approach did not solve the issue, and there were still a number of high-school-group-by-college blocks that lacked a sufficient number of potential comparison students to implement the other important aspect of our matching strategy, focal matching. Therefore, the matching process we ultimately implemented entailed matching within college-by-cohort blocks using propensity scores that were conditional on high school characteristics (e.g., school-level averages of math and English language arts MCAS scores, GPA, and college-going rate) as a proxy for exact matching on high schools. With matching within the college-by-cohort blocks, we aimed to control for the college-

---

matching variables. Rosenbaum and Rubin (1983) use the probability of being assigned to treatment given covariates as this function, which they call the *propensity score.*

related contemporaneous sources of bias and by matching on the high school characteristics, we aimed to control for the historical and locational sources of bias.

All BPS students attending UMass Boston are assigned a coach—some through Success Boston, others by UMass Boston staff. As such, considering non-SBC students from BPS as potential matches would be inappropriate. Therefore, for SBC students attending UMass Boston, comparison students were selected from among other UMass Boston students from districts with similar characteristics to BPS. Comparison districts were chosen by comparing median incomes[25] with Boston's median among those districts both that were within the top 20 sending districts to UMass Boston in either 2011 or 2012, and that contained at least one high school consistently sending no fewer than 10 students in any year and no fewer than 15 students a year, on average, to UMass Boston between 2009 and 2013.[26]

Focal Matching

Focal matching entails matching SBC students with non-SBC students who have similar values for individual self-selection confounders—that is, student-level factors related to the outcomes of interest and to the pairing of SBC students with specific coaching organizations. As mentioned above, we matched SBC and non-SBC students using propensity scores, which represent students' probability of receiving SBC coaching and are calculated as a function of the selection confounders.

When calculating propensity scores, a tension exists between including too many variables and including too few. On the one hand, it is tempting to use every student characteristic available to calculate a propensity score, such that treatment and comparison groups will be balanced on the greatest number of possible confounders. On the other hand, the more variables incorporated into a propensity score, the greater the likelihood that some may not be as balanced as would be using a more parsimonious set of matching variables. Focusing on a smaller set of particularly important variables therefore increases the efficiency of the propensity score to construct matched treatment and comparison groups most balanced on those student characteristics that pose the greatest threat to the calculation of unbiased treatment impacts.

We conducted a thorough literature review to determine pre-treatment (baseline) factors that were shown to be related to our outcomes of interest. Exhibits A-2 and A-3 present the results of this review. We also collected information from coaching organizations about criteria they use when selecting and/or targeting students for their programs. Most organizations indicated that they did not follow a strict selection process based on observable student characteristics when recruiting

---

[25] Median income is taken from ACS 2012 5-Year estimates for the towns in which districts lie (e.g., for the City of Everett when looking at Everett School District). Census data on median income was not available for all districts.

[26] Districts that provided comparison students included Avon, Braintree, Brockton, Everett, Fitchburg, Lawrence, Lowell, Malden, Medford, Milton, Norwell, Norwood, Quincy, Randolph, Revere, Somerville, West Bridgewater, Weymouth and Worcester. Because Cambridge Rindge and Latin (the only public high school in Cambridge) has part-time support staff who specifically support students applying to UMass Boston during the application phase, Cambridge was excluded from our consideration. UMass Boston also provides coaching to all of its Chelsea Public Schools graduates, removing Chelsea from the potential comparison pool.

students.[27] To avoid missing some important confounders, we decided in the estimation of the propensity scores to use all of the relevant variables yielded by the literature review and available in the administrative datasets.[28] Exhibit A-4 lists these variables.

Exhibit A-2: Postsecondary education outcomes literature reviewed

Source	Characteristic Discussed
Advisory Committee on Student Financial Assistance, 2013	ACT scores; full-time status; SES/affordability; spending per student
Allen, 1999	Motivation to finish school
Bridgeman, McCamley-Jenkins, & Ervin, 2000	SAT scores
Brown & Lee, 2005	Race/ethnicity
Buchmann & DiPrete, 2006	Gender
Cabrera, Nora, Castaneda, 1992	SES
Camara & Echternacht, 2000	High school GPA; SAT scores
Community College Leadership Forum, 2010	Faculty hiring practices; full-time status; spending per student
DeAngelo et al., 2011	Age; first-generation college-goer status; gender; institutional commitment (level of confidence in, and satisfaction with, institutional choice); parental education; postsecondary student achievement; race/ethnicity; SES/affordability; students' residency (on or off campus, near or far from campus);
DeBerard, Spielmans, & Julka, 2004	Early college performance; gender; high school GPA; SAT scores; social support
Dennis, Phinney, & Chuateco, 2005	High school GPA
Feldman, 1993	High school GPA; full-time status; race/ethnicity
Fletcher, 2010	Race/ethnicity
Flores, Batalovo, & Fix, 2012	English language learner status
Frazier et al., 2007	Learning differences
Gramling, 2013	Full-time status; high school GPA; race/ethnicity; SES/affordability
Harklau et al., 1999	English language learner status
Horn & Kojaku, 2001	Difficulty of high school curricula
Ishitani & DesJardins, 2002	Financial aid; parental education; SES
Kao & Thompson, 2003	Race/ethnicity
Lotkowski, Robbins, & Noeth, 2004	Academic skills, confidence, goals; ACT scores; financial aid; high school GPA; institutional commitment (level of confidence in, and satisfaction with, institutional choice); institutional selectivity; motivation to finish school; SES; social integration
Osbcorne, 2002	Gender; race/ethnicity
Seidman, 2005	Early college performance; financial aid; gender; high school GPA; on-campus employment; parental education; race/ethnicity; SAT scores; SES; social integration; students' residency (on or off campus, near or far from campus)
Steele, 2003	Race/ethnicity
Trainin & Swanson, 2005	Learning differences
Vogel & Adelman, 1992	Learning differences
Wagner et al., 2005	Learning differences and other disabilities
Zwick & Skylar, 2005	High school GPA; race/ethnicity; SAT scores

[27] One coaching organization indicated that it had eligibility criteria that included high school GPA and socioeconomic status (SES) indicators.

[28] Some of the variables yielded by the literature review pertained to students' experiences in postsecondary institutions (e.g., employment and on-campus residence). Because these variables are post treatment and may be influenced by coaching, we did not include them in the matching process.

Exhibit A-3: Summary of postsecondary education outcomes literature

Characteristic Discussed	Associated with Outcome?		
	Annual Persistence	Academic Achievement	Postsecondary Completion
Academic skills, confidence, goals	Yes	Yes	-
ACT scores	Yes	Yes	Yes
Age	-	-	Yes
Difficulty of high school curricula (at an individual student level; e.g., number of honors courses taken, etc.)	Yes	Yes	-
Early college performance	Yes	Yes	-
English language learner status	Yes	Yes	Yes
Financial aid	Yes	Yes	Yes
Full-time status	Yes	-	Yes
Gender	Yes	Yes	Yes
High school GPA	Yes	Yes	Yes
Institutional selectivity	Yes	-	-
Learning differences	Yes	Yes	Yes
Motivation to finish school	Yes	Mixed	Yes
On-campus employment	Yes	-	-
Parental education/first-generation college-goer status	Yes	Yes	Yes
Postsecondary student achievement	-	-	Yes
Race/ethnicity	Yes	Yes	Yes
SAT scores	Yes	Yes	Yes
SES	Yes	Yes	Yes
Social integration/support	Yes	Yes	-
Spending per student	-	-	Yes
Students' residency (on or off campus, near or far from campus)	Yes	-	Yes

Exhibit A-4: Matching characteristics

Variable	Domain	Data Source	Among Coaching Organization Selection Criteria
High school GPA	High School Performance	BPS and MA DESE	X
SAT scores			
10th-grade MCAS scores			
Advanced course taking in high school			
Age	Demographics	BPS and MA DESE	
Gender			
Learning differences			
Race/ethnicity			
SES			X
Ever designated as English language learner			
High school suspensions and detentions	Behavioral Indicators	BPS and MA DESE	
High school attendance			
Timing, source, and type of information received about postsecondary education and career options	Knowledge and Motivations about Postsecondary Education	BPS Exit Survey	

Because the measures of students' motivation and knowledge about postsecondary education from BPS Exit Surveys were not available for students from other Massachusetts districts, we performed a separate propensity score calculation—without postsecondary education knowledge indicators—among UMass Boston students. Missing values for the matching characteristics were addressed using the "dummy variable method" (Rosenbaum and Rubin 1984; Stuart 2010).[29]

A.2 Estimation of Propensity Scores

Propensity scores were estimated via four logistic regression models specified as below:[30]

1. Logistic model that includes all covariates listed above estimated with all SBC students from the 2013 cohort except those who enrolled in UMass Boston (treatment students) and non-SBC students from the 2013 BPS cohort who enrolled in the same colleges as the treatment students (potential comparison students)

2. Logistic model that includes all covariates listed above estimated with all SBC students from the 2014 cohort except those who enrolled in UMass Boston (treatment students) and non-SBC students from the 2014 BPS cohort who enrolled in the same colleges as the treatment students (potential comparison students)

[29] For variables available for all students, missing rates ranged from 0 percent to 12 percent. For BPS exit survey items, which were only available for BPS graduates, missing rates ranged from 12 percent to 18 percent. The dummy variable method entails replacing the missing values with the sample means and including a dummy variable indicating such values. As Stuart (2010) points out, propensity scores calculated in this manner would match both on observed covariate values and on missing data patterns.

[30] We included higher-order terms of and interactions between selected variables (e.g., Math MCAS scores squared, interactions between race/ethnicity indicators and SAT scores) to achieve better balance in some cases. Exhibit A-5 shows the higher-order terms and interactions included in each model.

3. Logistic model that includes all covariates listed above except those from BPS Exit Surveys estimated with SBC students from the 2013 cohort who enrolled in UMass Boston and non-SBC students who graduated from a high school in one of 19 Massachusetts districts in 2013 and who enrolled in UMass Boston

4. Logistic model that includes all covariates listed above except those from BPS Exit Surveys estimated with SBC students from the 2014 cohort who enrolled in UMass Boston and non-SBC students who graduated from a high school in one of 19 Massachusetts districts in 2014 and enrolled in UMass Boston.

As mentioned above, we estimated different propensity score models for the UMass Boston students and students from other colleges, because potential comparison students for the treatment students in UMass Boston lacked the BPS exit survey variables. We estimated separate models for the 2013 and 2014 cohorts to capture potential changes in the selection processes employed by the coaching organizations between the two years.

We present the results of the four models described above using the *average marginal effect* for each predictor, which was calculated by (1) estimating the "marginal effect" for each student, which represents the difference in the predicted probability of being in the treatment group corresponding to a unit change in that predictor while holding the values of all other predictors constant and (2) averaging the marginal effects across all students in the estimation sample.

We present the resulting average marginal effects for covariates in each model in Exhibit A-5. Some matching covariates were not significant predictors of receiving SBC in either of the models (e.g., age, gender, high school GPA) and some were significant predictors in only one model (absenteeism, Hispanic, Asian/Pacific Islander). Among the matching covariates significantly related to receipt of SBC in multiple models were the following: MCAS English and math scores, having a high incidence disability, high school averages of math MCAS scores and GPA, and eligibility for free or reduced-price lunch. High school averages of math MCAS scores and GPA were negatively related to SBC receipt (e.g., non-SBC students had higher MCAS English and math scores than SBC students) whereas eligibility for free or reduced-price lunch was positively related to being in the treatment group.

Exhibit A-5: Propensity score models: Average marginal effects

Matching Variables	2013 non-UMB Students	2013 UMB Students	2014 non-UMB Students	2014 UMB Students
Demographics				
Age	-0.026	0.035	-0.012	0.040
Female	0.042	0.016	0.037	0.054
Ever English language learner	0.033	0.091	0.117	0.099
Free/Reduced-Price Lunch Eligible	-0.027	0.142*	0.254*	0.618
High Incidence Disability	-0.108*	-0.097	-0.102*	0.051
Low Incidence Disability	0.154*		0.045	
Black	0.024	0.295	0.133	0.034
White	-0.177	0.262	-0.089	-0.133
Asian / Pacific Islander	0.141	-0.275	-0.752*	-0.288
Hispanic	0.448	0.563	-0.323*	-0.058
Other/Mixed	0.000	0.000	0.000	0.000
Native	0.491	0.479	0.410	-0.056
Achievement in High School				
SAT (2400)	0.000	0.000	0.000	0.000
MCAS English Score	-0.071*	0.023	-0.060*	-0.031
MCAS Math Score	-0.060*	0.014	0.037*	-0.022
GPA	0.096	-0.291	0.008	0.026
Number of Advanced Courses	0.000	0.003	-0.022	0.006
Took Any Advanced Course	0.103*	0.057	0.072*	0.030
Took Math MCAS by Grade 10	-0.001	-0.147	0.013	0.002
Took English MCAS by Grade 10	-0.062	0.256*	0.002	0.013
Behavioral				
Absenteeism	0.001	0.030*	0.000	-0.002
Number of Suspensions	-0.098		0.033	-0.077
Number of Activities	-0.010		0.003	
Had a Paid Job in High School	0.004		0.160*	
Spoke with Parent about Postsecondary Plans by Grade 8	0.065*		-0.005	
Spoke with an Organization about Postsecondary Plans	-0.013		0.063*	
Felt Prepared for College	-0.020		-0.077*	
Expected Level of Education: High School	-0.013		0.023	
Expected Level of Education: Associate's Degree	-0.001		0.037	
Expected Level of Education: Bachelor's Degree	-0.078		0.041	
Expected Level of Education: Master's	-0.060		0.040	
Expected Level of Education: Undecided	-0.110		0.000	
High School Characteristics				
High School Average Math MCAS Score	0.016	-0.047*	0.009*	-0.042*
High School Average English MCAS Score	0.005	0.029*	-0.015*	0.038*
High School Average GPA	-0.069	-0.225*	0.036	-0.443*
High School College-Going Rate	-0.250	0.947*	0.028	0.000
Interactions				
SAT Squared	0.000			
Asian x SAT	0.000	0.000	0.000	0.000
Hispanic x SAT	0.000	0.000	0.000*	
GPA Squared	0.026	0.059		
GPA x Number of Activities	0.010			
High School Avg MCAS Score x GPA	-0.004			
Paid Job x GPA	0.028			
Hispanic x GPA	-0.111*	-0.027	-0.003	
Asian x GPA	-0.020	-0.006	0.142*	0.036
High School Avg GPA x High School College-Going Rate				0.000

Matching Variables	2013 non-UMB Students	2013 UMB Students	2014 non-UMB Students	2014 UMB Students
Math MCAS Score Squared	-0.020			
English MCAS Score Squared	-0.031*			
Asian x Math MCAS score	0.098		-0.034	0.046
Asian x English MCAS score	0.030		-0.019	
Asian x Number of Advanced Courses				0.050
Hispanic x Paid Job			0.013	
Hispanic x Ever English language learner			0.106	
Free lunch Eligible x Ever English language learner	0.019		-0.197*	0.000
Free lunch Eligible x Absenteeism				-0.005
Free Lunch x Asian	0.153	0.055	0.000	
Black x Free Lunch	0.045		-0.164*	
Paid Job x Free Lunch	0.002		-0.173*	
White x Free Lunch	0.129		0.087	
Paid Job x Activities	-0.014			
Suspensions Squared				0.002
N	951	403	1177	467

* Significant at p<0.05.
UMB is University of Massachusetts Boston

A.3 Conducting Matching and Assessing Quality of the Matches

Matching Methods

We acknowledge that there are many variants of propensity score matching that differ by whether matching is conducted with replacement, how many comparison units are matched with each treatment unit, and whether common support is enforced for each treatment unit (Caliendo and Kopeinig 2008; Smith and Todd 2005; Stuart 2010). We implemented *radius matching*, which entailed matching each treatment student with all potential comparison students whose propensity scores were within the pre-specified caliper of his/her score (±0.2 of the standard deviation of the propensity scores) in his/her block. Matching was conducted with replacement, and matching weights captured the number of comparison units each treatment unit was matched with and vice versa. Treatment students who did not have any potential comparison students within their propensity score caliper were unmatched and excluded from the estimation of SBC effects.

We chose this method as our primary method because it balances the two important aspects of matching: closeness of the matches and the size of the matched groups. Using a caliper ensures that each treatment student is matched with comparison students with sufficiently similar propensity scores and the exclusion of treatment students without any such matches. Including all comparison units within the caliper maximizes the size of the analytic sample and statistical power.

The results reported in the main text (Chapters 4, 5, and 6) are obtained with the matched groups yielded by this method. We tested the sensitivity of these results by using another method called *nearest neighbor matching*, which entailed matching each treatment student with up to three potential comparison students who have the closest propensity score within the pre-specified caliper. By keeping the maximum number of matches at three, this method aims to get more tightly balanced matched groups than does radius matching, but the cost of this was having a smaller matched comparison group and less statistical power.

Both methods yielded matching weights that were taken into account when assessing baseline equivalence and calculating SBC effects. Matching and the assessment of the quality of the matches were conducted separately for each outcome measure to reflect the slight differences in the analytic samples for each measure.

Exhibit A-6 shows the sizes of the matched treatment and comparison groups for each outcome measure with the two methods. Across the nine measures, between 3 and 7 percent of the SBC students were unmatched for not having a sufficiently similar potential comparison student. Radius matching used more of the potential comparison students as matches (between 2 and 18 percent of the potential comparisons were not matched) than the 3:1 nearest neighbor matching (between 53 and 64 percent of the potential comparisons were not matched) and yielded a matched comparison group that is at least twice as large as the comparison group yielded by the nearest neighbor matching.

Exhibit A-6: Sample sizes for each outcome, by matching method

	Persistence into Second Year		Persistence into Third Year		Continuous Semesters		Full-Time Enrollment		Academic Good Standing	
	Radius	Nearest Neighbor	Radius	Nearest Neighbor	Radius	Nearest Neighbor	Radius	Nearest Neighbor	Radius	Nearest Neighbor
Matched Treatment Students	678	678	302	302	672	672	610	610	610	610
Non-Matched Treatment Students	37	37	22	22	37	37	24	24	24	24
% Treatment Students Not Matched	5%	5%	7%	7%	5%	5%	4%	4%	4%	4%
Matched Comparison Group	1,834	812	801	359	1,852	818	1,382	677	1,382	677
Potential Comparisons Not Matched	397	1,419	186	628	385	1,419	49	754	49	754
% Potential Comparison Unmatched	18%	64%	19%	64%	17%	63%	3%	53%	3%	53%

	Cumulative GPA		Credit Accumulation		Non Credit Bearing Semesters		FAFSA Renewal	
	Radius	Nearest Neighbor	Radius	Nearest Neighbor	Radius	Nearest Neighbor	Radius	Nearest Neighbor
Matched Treatment Students	610	610	562	562	610	610	534	534
Non-Matched Treatment Students	24	24	30	30	24	24	17	17
% Treatment Students Not Matched	4%	4%	5%	5%	4%	4%	3%	3%
Matched Comparison Group	1,380	677	1,312	637	1,382	677	1,277	612
Potential Comparisons Not Matched	49	752	59	734	49	754	25	690
% Potential Comparison Unmatched	3%	53%	4%	54%	3%	53%	2%	53%

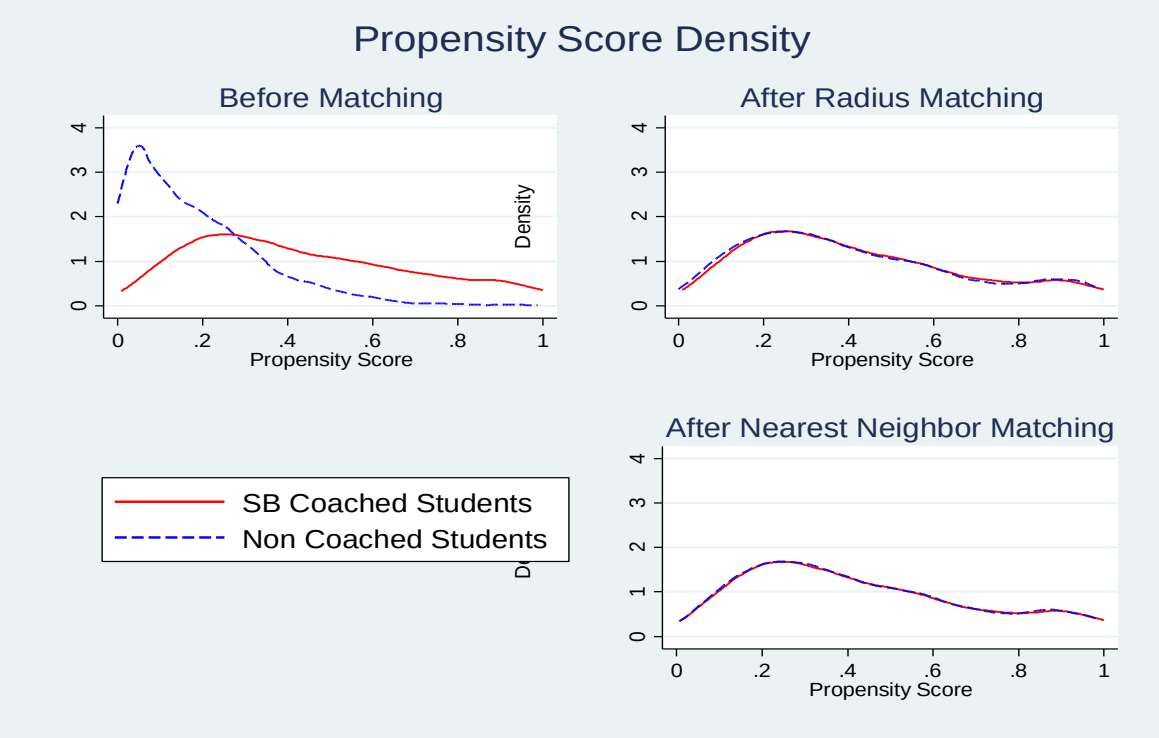
A.4 Matching Diagnostics

The most important step in matching is to examine to what extent matching worked by checking the balance of the matched treatment and comparison groups. As explained in more detail below, we assessed the balance of the matched by examining the distribution of the propensity scores in the matched treatment and comparison groups and also assessing the standardized difference of each matching variable between the two groups. We used an iterative process to pick the final matched groups. This process entailed (1) fitting the propensity score model with the matching covariates as described in Section A.2; (2) conducting matching as described in Section A.3.1; and (3) assessing baseline balance. If balance was satisfactory, we deemed the matched groups as final and used them in the estimation of effects; if balance was not satisfactory, the propensity model in step 3 is modified to include higher-order terms and interactions of the unbalanced matching variances, and the whole process was repeated until satisfactory balance was achieved. This process was conducted separately for each outcome measure.

Exhibits A-7 through A-9 provide evidence for the balance of the final matched groups for the outcome measure *persistence intro the second year of college*. The balance of the matched groups for the other outcomes was similar.

The top left panel of Exhibit A-7 shows that before matching, distributions of propensity scores for treatment students and potential comparison students were somewhat different, with the latter being more skewed to the right than the former. The remaining panels show that either matching method yields matched treatment and comparison groups with overlapping propensity score distributions.

Exhibit A-7: Distributions of propensity scores



The literature on propensity score matching suggests that having similar propensity score distributions within the matched groups is a necessary but not sufficient condition for having balanced groups (King and Nielsen 2016; Morgan and Winship 2014). Following Rosenbaum and Rubin (1985) and What Works Clearinghouse (2014), we explicitly assessed to what extent matching improved the covariate balance by examining the standardized differences in the means of each matching covariate between the treatment students and potential comparison students prior to matching and between the matched groups after matching.

We calculated the standardized differences ("effect sizes") as follows: For each matching covariate, we first fit a weighted regression model that used the matching covariate as the dependent variable and the treatment group indicator and indicators for matching blocks (for local matching) as independent variables. The standardized difference was then calculated as the ratio of the coefficient on the treatment indicator to the pooled standard deviation of the matching covariate across the treatment students and potential comparison students. To establish baseline balance between the treatment students and matched comparison students, we required the standardized differences to be less than 15 percent of a standard deviation in absolute value[31] for all matching variables.

Exhibit A-8 shows the standardized baseline differences before and after matching for each outcome measure with radius matching. As an example, let's examine the differences for *persistence into the second year of college*. The first column in the exhibit shows that the pre-matching differences for some variables are notably large: -0.378 standard deviations (SDs) for white, -0.288 SDs for SAT scores, and -0.253 SDs for English MCAS scores. The second column shows that matching reduced all of the pre-matching differences that were larger than the 0.15 standard deviations threshold without distorting the balance for the variables that had been balanced prior to matching. Out of the 38 matching variables, the post-matching differences were smaller than 0.05 SDs (in absolute value) for 34 variables, between 0.05 and 0.1 SDs for 3 variables, and between 0.1 and 0.15 SDs for only 1 variable. The balance estimates for the other outcomes were similar to the second year persistence measure. Based on these results, we deemed that the matched treatment and comparison groups were balanced and used them in the estimation of SBC effects.

[31] Note that this is a more stringent criterion than what is used by the WWC, which requires the baseline differences between quasi-experimental treatment and comparison groups be less than 0.25 standard deviations to meet their evidence standards.

Exhibit A-8: Standardized baseline differences by outcome, radius matching

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Outcome: Persistence into the Second Year		
Demographics		
Age	0.076	-0.052
Female	0.173	-0.022
Ever English Language Learner	0.151	0.015
Free/Reduced-Price Lunch Eligible	0.361	0.083
High Incidence Disability	-0.070	0.019
Low Incidence Disability	0.112	0.038
Black	0.141	-0.034
White	-0.378	-0.048
Asian / Pacific Islander	-0.027	0.124
Hispanic	0.177	-0.026
Other/Mixed	-0.037	0.011
Native	0.028	0.004
Achievement in High School		
SAT (2400)	-0.288	-0.011
MCAS English Score	-0.253	-0.049
MCAS Math Score	-0.039	0.005
GPA	0.017	0.013
Number of Advanced Courses	0.166	-0.015
Took Any Advanced Course	0.225	0.002
Took Math MCAS by Grade 10	-0.061	0.023
Took English MCAS by Grade 10	-0.058	-0.021
Behavioral		
Absenteeism	0.027	0.001
Number of Suspensions	-0.071	-0.007
Number of Activities	0.178	-0.015
Had a Paid Job in High School	0.046	0.010
Spoke with Parent about Postsecondary Plans by Grade 8	0.016	0.007
Spoke with an Organization about Postsecondary Plans	0.081	-0.016
Felt Prepared for College	-0.133	-0.048
Expected Level of Education: High School	0.067	-0.010
Expected Level of Education: Associate's Degree	0.033	0.031
Expected Level of Education: Bachelor's Degree	0.020	0.057
Expected Level of Education: Master's	0.049	0.025
Expected Level of Education: Undecided	-0.110	-0.022
High School Characteristics		
High School Average Math MCAS Score	-0.274	-0.063
High School Average English MCAS Score	-0.184	-0.027
High School Average GPA	-0.279	0.016
High School College-Going Rate	-0.116	0.005
Outcome: Persistence into the third Year		
Demographics		
Age	0.076	-0.049
Female	0.141	-0.056
Ever English Language Learner	0.158	0.010
Free/Reduced-Price Lunch Eligible	0.296	0.115
High Incidence Disability	-0.115	-0.025
Low Incidence Disability	0.173	0.024
Black	0.109	-0.070
White	-0.414	-0.087

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Asian / Pacific Islander	-0.027	0.041
Hispanic	0.230	0.089
Other/Mixed	-0.099	-0.063
Native	0.044	0.032
Achievement in High School		
SAT (2400)	-0.309	-0.017
MCAS English Score	-0.208	-0.087
MCAS Math Score	-0.063	-0.008
GPA	0.064	0.053
Number of Advanced Courses	0.205	0.020
Took Any Advanced Course	0.248	0.048
Took Math MCAS by Grade 10	-0.157	0.050
Took English MCAS by Grade 10	-0.137	-0.022
Behavioral		
Absenteeism	0.046	-0.001
Number of Suspensions	-0.070	-0.020
Number of Activities	0.254	-0.024
Had a Paid Job in High School	0.076	0.045
Spoke with Parent about Postsecondary Plans by Grade 8	0.100	0.054
Spoke with an Organization about Postsecondary Plans	0.035	0.021
Felt Prepared for College	-0.038	-0.021
Expected Level of Education: High School	0.100	-0.041
Expected Level of Education: Associate's Degree	-0.012	0.006
Expected Level of Education: Bachelor's Degree	-0.008	0.079
Expected Level of Education: Master's	0.106	0.023
Expected Level of Education: Undecided	-0.139	-0.021
High School Characteristics		
High School Average Math MCAS Score	-0.223	-0.023
High School Average English MCAS Score	-0.130	0.001
High School Average GPA	-0.239	0.016
High School College-Going Rate	-0.138	0.007
Outcome: Continuous Enrollment		
Demographics		
Age	0.068	-0.058
Female	0.181	-0.012
Ever English Language Learner	0.157	0.021
Free/Reduced-Price Lunch Eligible	0.359	0.080
High Incidence Disability	-0.062	0.023
Low Incidence Disability	0.110	0.038
Black	0.133	-0.047
White	-0.377	-0.046
Asian / Pacific Islander	-0.027	0.127
Hispanic	0.185	-0.016
Other/Mixed	-0.035	0.011
Native	0.029	0.007
Achievement in High School		
SAT (2400)	-0.293	-0.019
MCAS English Score	-0.262	-0.057
MCAS Math Score	-0.045	-0.001
GPA	0.019	0.020
Number of Advanced Courses	0.163	-0.017
Took Any Advanced Course	0.214	-0.009
Took Math MCAS by Grade 10	-0.066	0.016

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Took English MCAS by Grade 10	-0.062	-0.027
Behavioral		
Absenteeism	0.026	0.001
Number of Suspensions	-0.068	-0.006
Number of Activities	0.168	-0.025
Had a Paid Job in High School	0.050	0.013
Spoke with Parent about Postsecondary Plans by Grade 8	0.021	0.009
Spoke with an Organization about Postsecondary Plans	0.082	-0.019
Felt Prepared for College	-0.124	-0.041
Expected Level of Education: High School	0.076	-0.002
Expected Level of Education: Associate's Degree	0.020	0.029
Expected Level of Education: Bachelor's Degree	0.008	0.043
Expected Level of Education: Master's	0.059	0.035
Expected Level of Education: Undecided	-0.115	-0.024
High School Characteristics		
High School Average Math MCAS Score	-0.282	-0.074
High School Average English MCAS Score	-0.190	-0.036
High School Average GPA	-0.276	0.013
High School College-Going Rate	-0.116	0.002
Outcome: Full-Time Status		
Demographics		
Age	0.081	-0.057
Female	0.180	-0.034
Ever English Language Learner	0.116	-0.016
Free/Reduced-Price Lunch Eligible	0.385	0.083
High Incidence Disability	-0.054	0.035
Low Incidence Disability	0.094	0.058
Black	0.171	-0.015
White	-0.380	-0.036
Asian / Pacific Islander	-0.036	0.113
Hispanic	0.149	-0.045
Other/Mixed	-0.033	0.029
Native	0.001	-0.029
Achievement in High School		
SAT (2400)	-0.302	-0.015
MCAS English Score	-0.252	-0.052
MCAS Math Score	-0.023	-0.005
GPA	0.032	0.019
Number of Advanced Courses	0.188	-0.017
Took Any Advanced Course	0.245	0.008
Took Math MCAS by Grade 10	-0.038	0.045
Took English MCAS by Grade 10	-0.044	0.002
Behavioral		
Absenteeism	0.026	-0.002
Number of Suspensions	-0.050	0.023
Number of Activities	0.213	-0.005
Had a Paid Job in High School	0.063	0.010
Spoke with Parent about Postsecondary Plans by Grade 8	-0.006	-0.009
Spoke with an Organization about Postsecondary Plans	0.067	-0.021
Felt Prepared for College	-0.135	-0.040
Expected Level of Education: High School	0.073	0.007
Expected Level of Education: Associate's Degree	0.036	0.032
Expected Level of Education: Bachelor's Degree	0.042	0.069

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Expected Level of Education: Master's	0.078	0.032
Expected Level of Education: Undecided	-0.140	-0.039
High School Characteristics		
High School Average Math MCAS Score	-0.283	-0.073
High School Average English MCAS Score	-0.181	-0.044
High School Average GPA	-0.277	0.001
High School College-Going Rate	-0.094	-0.004
Outcome: GPA		
Demographics		
Age	0.080	-0.058
Female	0.179	-0.035
Ever English Language Learner	0.118	-0.015
Free/Reduced-Price Lunch Eligible	0.386	0.083
High Incidence Disability	-0.055	0.034
Low Incidence Disability	0.094	0.057
Black	0.172	-0.014
White	-0.381	-0.036
Asian / Pacific Islander	-0.036	0.113
Hispanic	0.148	-0.046
Other/Mixed	-0.033	0.029
Native	0.001	-0.029
Achievement in High School		
SAT (2400)	-0.302	-0.015
MCAS English Score	-0.252	-0.052
MCAS Math Score	-0.023	-0.005
GPA	0.032	0.019
Number of Advanced Courses	0.188	-0.017
Took Any Advanced Course	0.245	0.008
Took Math MCAS by Grade 10	-0.038	0.045
Took English MCAS by Grade 10	-0.044	0.002
Behavioral		
Absenteeism	0.026	-0.002
Number of Suspensions	-0.050	0.023
Number of Activities	0.213	-0.005
Had a Paid Job in High School	0.063	0.010
Spoke with Parent about Postsecondary Plans by Grade 8	-0.006	-0.009
Spoke with an Organization about Postsecondary Plans	0.067	-0.021
Felt Prepared for College	-0.135	-0.040
Expected Level of Education: High School	0.073	0.007
Expected Level of Education: Associate's Degree	0.036	0.032
Expected Level of Education: Bachelor's Degree	0.042	0.069
Expected Level of Education: Master's	0.078	0.032
Expected Level of Education: Undecided	-0.140	-0.039
High School Characteristics		
High School Average Math MCAS Score	-0.283	-0.073
High School Average English MCAS Score	-0.181	-0.044
High School Average GPA	-0.277	0.001
High School College-Going Rate	-0.094	-0.004
Outcome: Good Academic Standing		
Demographics		
Age	0.081	-0.057
Female	0.180	-0.034
Ever English Language Learner	0.116	-0.016

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Free/Reduced-Price Lunch Eligible	0.385	0.083
High Incidence Disability	-0.054	0.035
Low Incidence Disability	0.094	0.058
Black	0.171	-0.015
White	-0.380	-0.036
Asian / Pacific Islander	-0.036	0.113
Hispanic	0.149	-0.045
Other/Mixed	-0.033	0.029
Native	0.001	-0.029
Achievement in High School		
SAT (2400)	-0.302	-0.015
MCAS English Score	-0.252	-0.052
MCAS Math Score	-0.023	-0.005
GPA	0.032	0.019
Number of Advanced Courses	0.188	-0.017
Took Any Advanced Course	0.245	0.008
Took Math MCAS by Grade 10	-0.038	0.045
Took English MCAS by Grade 10	-0.044	0.002
Behavioral		
Absenteeism	0.026	-0.002
Number of Suspensions	-0.050	0.023
Number of Activities	0.213	-0.005
Had a Paid Job in High School	0.063	0.010
Spoke with Parent about Postsecondary Plans by Grade 8	-0.006	-0.009
Spoke with an Organization about Postsecondary Plans	0.067	-0.021
Felt Prepared for College	-0.135	-0.040
Expected Level of Education: High School	0.073	0.007
Expected Level of Education: Associate's Degree	0.036	0.032
Expected Level of Education: Bachelor's Degree	0.042	0.069
Expected Level of Education: Master's	0.078	0.032
Expected Level of Education: Undecided	-0.140	-0.039
High School Characteristics		
High School Average Math MCAS Score	-0.283	-0.073
High School Average English MCAS Score	-0.181	-0.044
High School Average GPA	-0.277	0.001
High School College-Going Rate	-0.094	-0.004
Outcome: Semesters Enrolled in Non-Credit-Bearing Courses		
Demographics		
Age	0.081	-0.057
Female	0.180	-0.034
Ever English Language Learner	0.116	-0.016
Free/Reduced-Price Lunch Eligible	0.385	0.083
High Incidence Disability	-0.054	0.035
Low Incidence Disability	0.094	0.058
Black	0.171	-0.015
White	-0.380	-0.036
Asian / Pacific Islander	-0.036	0.113
Hispanic	0.149	-0.045
Other/Mixed	-0.033	0.029
Native	0.001	-0.029
Achievement in High School		
SAT (2400)	-0.302	-0.015
MCAS English Score	-0.252	-0.052

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
MCAS Math Score	-0.023	-0.005
GPA	0.032	0.019
Number of Advanced Courses	0.188	-0.017
Took Any Advanced Course	0.245	0.008
Took Math MCAS by Grade 10	-0.038	0.045
Took English MCAS by Grade 10	-0.044	0.002
Behavioral		
Absenteeism	0.026	-0.002
Number of Suspensions	-0.050	0.023
Number of Activities	0.213	-0.005
Had a Paid Job in High School	0.063	0.010
Spoke with Parent about Postsecondary Plans by Grade 8	-0.006	-0.009
Spoke with an Organization about Postsecondary Plans	0.067	-0.021
Felt Prepared for College	-0.135	-0.040
Expected Level of Education: High School	0.073	0.007
Expected Level of Education: Associate's Degree	0.036	0.032
Expected Level of Education: Bachelor's Degree	0.042	0.069
Expected Level of Education: Master's	0.078	0.032
Expected Level of Education: Undecided	-0.140	-0.039
High School Characteristics		
High School Average Math MCAS Score	-0.283	-0.073
High School Average English MCAS Score	-0.181	-0.044
High School Average GPA	-0.277	0.001
High School College-Going Rate	-0.094	-0.004
Outcome: Credit Accumulation		
Demographics		
Age	0.082	-0.038
Female	0.203	-0.011
Ever English Language Learner	0.112	-0.041
Free/Reduced-Price Lunch Eligible	0.375	0.079
High Incidence Disability	-0.048	0.027
Low Incidence Disability	0.087	0.044
Black	0.175	0.001
White	-0.376	-0.038
Asian / Pacific Islander	-0.029	0.116
Hispanic	0.139	-0.063
Other/Mixed	-0.026	0.032
Native	0.003	-0.026
Achievement in High School		
SAT (2400)	-0.303	-0.028
MCAS English Score	-0.246	-0.031
MCAS Math Score	-0.037	-0.016
GPA	0.031	0.046
Number of Advanced Courses	0.173	-0.048
Took Any Advanced Course	0.246	-0.010
Took Math MCAS by Grade 10	-0.028	0.071
Took English MCAS by Grade 10	-0.038	0.014
Behavioral		
Absenteeism	0.024	-0.008
Number of Suspensions	-0.068	-0.009
Number of Activities	0.195	0.015
Had a Paid Job in High School	0.055	0.020
Spoke with Parent about Postsecondary Plans by Grade 8	0.013	-0.008

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Spoke with an Organization about Postsecondary Plans	0.062	-0.032
Felt Prepared for College	-0.132	-0.044
Expected Level of Education: High School	0.043	-0.036
Expected Level of Education: Associate's Degree	0.044	0.044
Expected Level of Education: Bachelor's Degree	0.035	0.043
Expected Level of Education: Master's	0.083	0.058
Expected Level of Education: Undecided	-0.142	-0.056
High School Characteristics		
High School Average Math MCAS Score	-0.272	-0.058
High School Average English MCAS Score	-0.172	-0.027
High School Average GPA	-0.274	-0.002
High School College-Going Rate	-0.090	0.009
Outcome: FAFSA Renewal		
Demographics		
Age	0.110	-0.025
Female	0.159	-0.097
Ever English Language Learner	0.102	-0.047
Free/Reduced-Price Lunch Eligible	0.370	0.072
High Incidence Disability	-0.047	0.049
Low Incidence Disability	0.091	0.061
Black	0.168	0.000
White	-0.385	-0.053
Asian / Pacific Islander	-0.030	0.119
Hispanic	0.159	-0.055
Other/Mixed	-0.037	0.013
Native	0.001	-0.030
Achievement in High School		
SAT (2400)	-0.278	-0.002
MCAS English Score	-0.249	-0.049
MCAS Math Score	0.003	0.013
GPA	0.023	0.018
Number of Advanced Courses	0.225	0.040
Took Any Advanced Course	0.288	0.073
Took Math MCAS by Grade 10	-0.036	0.042
Took English MCAS by Grade 10	-0.048	-0.010
Behavioral		
Absenteeism	0.026	-0.003
Number of Suspensions	-0.062	0.008
Number of Activities	0.249	0.052
Had a Paid Job in High School	0.084	0.032
Spoke with Parent about Postsecondary Plans by Grade 8	0.000	-0.013
Spoke with an Organization about Postsecondary Plans	0.082	0.009
Felt Prepared for College	-0.141	-0.051
Expected Level of Education: High School	0.072	-0.006
Expected Level of Education: Associate's Degree	0.062	0.062
Expected Level of Education: Bachelor's Degree	0.063	0.077
Expected Level of Education: Master's	0.099	0.048
Expected Level of Education: Undecided	-0.096	0.003
High School Characteristics		
High School Average Math MCAS Score	-0.222	-0.045
High School Average English MCAS Score	-0.094	-0.009
High School Average GPA	-0.255	0.017
High School College-Going Rate	-0.051	0.012

Finally, Exhibit A-8 shows the pre- and post-matching differences with nearest neighborhood matching. The post-matching differences for all instances except one were under the 0.15 standard deviations threshold.[32] Comparing Exhibits A-8 and A-9 suggest that the two methods yielded very close baseline differences. There was no systematic pattern as to which whether one method yielded smaller baseline differences than the other one and the differences for the two methods were very close. These results supported our choice of the radius matching as our primary method because it yielded a much larger comparison group that did not appear to be worse in terms of baseline balance than the smaller comparison group yielded by nearest neighbor matching.

Exhibit A-9: Standardized baseline differences by outcome, nearest neighbor matching

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Outcome: Persistence into the Second Year		
Demographics		
Age	0.076	-0.054
Female	0.173	-0.039
Ever English Language Learner	0.151	0.031
Free/Reduced-Price Lunch Eligible	0.361	0.034
High Incidence Disability	-0.070	0.077
Low Incidence Disability	0.112	0.037
Black	0.141	-0.033
White	-0.378	0.006
Asian / Pacific Islander	-0.027	0.120
Hispanic	0.177	-0.057
Other/Mixed	-0.037	0.032
Native	0.028	-0.009
Achievement in High School		
SAT (2400)	-0.288	0.017
MCAS English Score	-0.253	-0.044
MCAS Math Score	-0.039	0.001
GPA	0.017	0.028
Number of Advanced Courses	0.166	-0.020
Took Any Advanced Course	0.225	0.001
Took Math MCAS by Grade 10	-0.061	0.017
Took English MCAS after Grade 10	0.077	0.012
Behavioral		
Absenteeism	0.027	-0.001
Number of Suspensions	-0.071	-0.033
Number of Activities	0.178	-0.025
Had a Paid Job in High School	0.046	-0.018
Spoke with Parent about Postsecondary Plans by Grade 8	0.016	0.030
Spoke with an Organization about Postsecondary Plans	0.081	-0.004
Felt Prepared for College	-0.133	-0.036
Expected Level of Education: High School	0.067	0.012
Expected Level of Education: Associate's Degree	0.033	-0.004
Expected Level of Education: Bachelor's Degree	0.020	0.093
Expected Level of Education: Master's	0.049	0.033

[32] The exception was the standardized difference for "expected level of education" for the outcome "FAFSA completion," which was 0.166.

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Expected Level of Education: Undecided	-0.110	-0.030
High School Characteristics		
High School Average Math MCAS Score	-0.274	-0.042
High School Average English MCAS Score	-0.184	0.009
High School Average GPA	-0.279	0.037
High School College-Going Rate	-0.116	0.030
Outcome: Persistence into the Third Year		
Demographics		
Age	0.076	-0.044
Female	0.141	-0.116
Ever English Language Learner	0.158	0.014
Free/Reduced-Price Lunch Eligible	0.296	0.065
High Incidence Disability	-0.115	0.053
Low Incidence Disability	0.173	0.032
Black	0.109	-0.044
White	-0.414	-0.029
Asian / Pacific Islander	-0.027	0.024
Hispanic	0.230	0.045
Other/Mixed	-0.099	-0.078
Native	0.044	0.014
Achievement in High School		
SAT (2400)	-0.309	-0.006
MCAS English Score	-0.208	-0.102
MCAS Math Score	-0.063	-0.016
GPA	0.064	0.077
Number of Advanced Courses	0.205	0.001
Took Any Advanced Course	0.248	0.047
Took Math MCAS by Grade 10	-0.157	0.043
Took English MCAS after Grade 10	0.158	0.020
Behavioral		
Absenteeism	0.046	-0.005
Number of Suspensions	-0.070	-0.088
Number of Activities	0.254	-0.080
Had a Paid Job in High School	0.076	0.040
Spoke with Parent about Postsecondary Plans by Grade 8	0.100	0.081
Spoke with an Organization about Postsecondary Plans	0.035	0.012
Felt Prepared for College	-0.038	0.005
Expected Level of Education: High School	0.100	-0.039
Expected Level of Education: Associate's Degree	-0.012	-0.009
Expected Level of Education: Bachelor's Degree	-0.008	0.098
Expected Level of Education: Master's	0.106	0.038
Expected Level of Education: Undecided	-0.139	-0.031
High School Characteristics		
High School Average Math MCAS Score	-0.223	-0.004
High School Average English MCAS Score	-0.130	0.039
High School Average GPA	-0.239	0.039
High School College-Going Rate	-0.138	0.062
Outcome: Continuous Enrollment		
Demographics		
Age	0.068	-0.061
Female	0.181	-0.027
Ever English Language Learner	0.157	0.039
Free/Reduced-Price Lunch Eligible	0.359	0.034

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
High Incidence Disability	-0.062	0.077
Low Incidence Disability	0.110	0.041
Black	0.133	-0.046
White	-0.377	0.008
Asian / Pacific Islander	-0.027	0.124
Hispanic	0.185	-0.049
Other/Mixed	-0.035	0.033
Native	0.029	0.000
Achievement in High School		
SAT (2400)	-0.293	0.005
MCAS English Score	-0.262	-0.054
MCAS Math Score	-0.045	-0.007
GPA	0.019	0.033
Number of Advanced Courses	0.163	-0.022
Took Any Advanced Course	0.214	-0.010
Took Math MCAS by Grade 10	-0.066	0.007
Took English MCAS after Grade 10	0.089	0.026
Behavioral		
Absenteeism	0.026	-0.001
Number of Suspensions	-0.068	-0.037
Number of Activities	0.168	-0.035
Had a Paid Job in High School	0.050	-0.022
Spoke with Parent about Postsecondary Plans by Grade 8	0.021	0.022
Spoke with an Organization about Postsecondary Plans	0.082	-0.004
Felt Prepared for College	-0.124	-0.028
Expected Level of Education: High School	0.076	0.024
Expected Level of Education: Associate's Degree	0.020	-0.008
Expected Level of Education: Bachelor's Degree	0.008	0.067
Expected Level of Education: Master's	0.059	0.047
Expected Level of Education: Undecided	-0.115	-0.027
High School Characteristics		
High School Average Math MCAS Score	-0.282	-0.050
High School Average English MCAS Score	-0.190	0.002
High School Average GPA	-0.276	0.031
High School College-Going Rate	-0.116	0.027
Outcome: Full-Time Status		
Demographics		
Age	0.081	-0.059
Female	0.180	-0.063
Ever English Language Learner	0.116	-0.008
Free/Reduced-Price Lunch Eligible	0.385	0.042
High Incidence Disability	-0.054	0.089
Low Incidence Disability	0.094	0.063
Black	0.171	-0.023
White	-0.380	0.000
Asian / Pacific Islander	-0.036	0.105
Hispanic	0.149	-0.053
Other/Mixed	-0.033	0.038
Native	0.001	-0.041
Achievement in High School		
SAT (2400)	-0.302	0.013
MCAS English Score	-0.252	-0.062
MCAS Math Score	-0.023	-0.013

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
GPA	0.032	0.015
Number of Advanced Courses	0.188	-0.035
Took Any Advanced Course	0.245	-0.002
Took Math MCAS by Grade 10	-0.038	0.037
Took English MCAS after Grade 10	0.086	-0.004
Behavioral		
Absenteeism	0.026	-0.002
Number of Suspensions	-0.050	-0.009
Number of Activities	0.213	-0.057
Had a Paid Job in High School	0.063	-0.031
Spoke with Parent about Postsecondary Plans by Grade 8	-0.006	-0.050
Spoke with an Organization about Postsecondary Plans	0.067	-0.005
Felt Prepared for College	-0.135	-0.017
Expected Level of Education: High School	0.073	0.044
Expected Level of Education: Associate's Degree	0.036	-0.004
Expected Level of Education: Bachelor's Degree	0.042	0.120
Expected Level of Education: Master's	0.078	0.028
Expected Level of Education: Undecided	-0.140	-0.051
High School Characteristics		
High School Average Math MCAS Score	-0.283	-0.044
High School Average English MCAS Score	-0.181	-0.003
High School Average GPA	-0.277	0.025
High School College-Going Rate	-0.094	0.025
Outcome: GPA		
Demographics		
Age	0.081	-0.059
Female	0.180	-0.063
Ever English Language Learner	0.116	-0.008
Free/Reduced-Price Lunch Eligible	0.385	0.042
High Incidence Disability	-0.054	0.089
Low Incidence Disability	0.094	0.063
Black	0.171	-0.023
White	-0.380	0.000
Asian / Pacific Islander	-0.036	0.105
Hispanic	0.149	-0.053
Other/Mixed	-0.033	0.038
Native	0.001	-0.041
Achievement in High School		
SAT (2400)	-0.302	0.013
MCAS English Score	-0.252	-0.062
MCAS Math Score	-0.023	-0.013
GPA	0.032	0.015
Number of Advanced Courses	0.188	-0.035
Took Any Advanced Course	0.245	-0.002
Took Math MCAS by Grade 10	-0.038	0.037
Took English MCAS after Grade 10	0.086	-0.004
Behavioral		
Absenteeism	0.026	-0.002
Number of Suspensions	-0.050	-0.009
Number of Activities	0.213	-0.057
Had a Paid Job in High School	0.063	-0.031
Spoke with Parent about Postsecondary Plans by Grade 8	-0.006	-0.050
Spoke with an Organization about Postsecondary Plans	0.067	-0.005

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Felt Prepared for College	-0.135	-0.017
Expected Level of Education: High School	0.073	0.044
Expected Level of Education: Associate's Degree	0.036	-0.004
Expected Level of Education: Bachelor's Degree	0.042	0.120
Expected Level of Education: Master's	0.078	0.028
Expected Level of Education: Undecided	-0.140	-0.051
High School Characteristics		
High School Average Math MCAS Score	-0.283	-0.044
High School Average English MCAS Score	-0.181	-0.003
High School Average GPA	-0.277	0.025
High School College-Going Rate	-0.094	0.025
Outcome: Good Academic Standing		
Demographics		
Age	0.081	-0.059
Female	0.180	-0.063
Ever English Language Learner	0.116	-0.008
Free/Reduced-Price Lunch Eligible	0.385	0.042
High Incidence Disability	-0.054	0.089
Low Incidence Disability	0.094	0.063
Black	0.171	-0.023
White	-0.380	0.000
Asian / Pacific Islander	-0.036	0.105
Hispanic	0.149	-0.053
Other/Mixed	-0.033	0.038
Native	0.001	-0.041
Achievement in High School		
SAT (2400)	-0.302	0.013
MCAS English Score	-0.252	-0.062
MCAS Math Score	-0.023	-0.013
GPA	0.032	0.015
Number of Advanced Courses	0.188	-0.035
Took Any Advanced Course	0.245	-0.002
Took Math MCAS by Grade 10	-0.038	0.037
Took English MCAS by Grade 10	-0.044	0.020
Took Math MCAS after Grade 10	0.074	-0.018
Took English MCAS after Grade 10	0.086	-0.004
Behavioral		
Absenteeism	0.026	-0.002
Number of Suspensions	-0.050	-0.009
Number of Activities	0.213	-0.057
Had a Paid Job in High School	0.063	-0.031
Spoke with Parent about Postsecondary Plans by Grade 8	-0.006	-0.050
Spoke with an Organization about Postsecondary Plans	0.067	-0.005
Felt Prepared for College	-0.135	-0.017
Expected Level of Education: High School	0.073	0.044
Expected Level of Education: Associate's Degree	0.036	-0.004
Expected Level of Education: Bachelor's Degree	0.042	0.120
Expected Level of Education: Master's	0.078	0.028
Expected Level of Education: Undecided	-0.140	-0.051
High School Characteristics		
High School Average Math MCAS Score	-0.283	-0.044
High School Average English MCAS Score	-0.181	-0.003
High School Average GPA	-0.277	0.025

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
High School College-Going Rate	-0.094	0.025
Outcome: Semesters Enrolled in Non-Credit-Bearing Courses		
Demographics		
Age	0.081	-0.059
Female	0.180	-0.063
Ever English Language Learner	0.116	-0.008
Free/Reduced-Price Lunch Eligible	0.385	0.042
High Incidence Disability	-0.054	0.089
Low Incidence Disability	0.094	0.063
Black	0.171	-0.023
White	-0.380	0.000
Asian / Pacific Islander	-0.036	0.105
Hispanic	0.149	-0.053
Other/Mixed	-0.033	0.038
Native	0.001	-0.041
Achievement in High School		
SAT (2400)	-0.302	0.013
MCAS English Score	-0.252	-0.062
MCAS Math Score	-0.023	-0.013
GPA	0.032	0.015
Number of Advanced Courses	0.188	-0.035
Took Any Advanced Course	0.245	-0.002
Took Math MCAS by Grade 10	-0.038	0.037
Took English MCAS after Grade 10	0.086	-0.004
Behavioral		
Absenteeism	0.026	-0.002
Number of Suspensions	-0.050	-0.009
Number of Activities	0.213	-0.057
Had a Paid Job in High School	0.063	-0.031
Spoke with Parent about Postsecondary Plans by Grade 8	-0.006	-0.050
Spoke with an Organization about Postsecondary Plans	0.067	-0.005
Felt Prepared for College	-0.135	-0.017
Expected Level of Education: High School	0.073	0.044
Expected Level of Education: Associate's Degree	0.036	-0.004
Expected Level of Education: Bachelor's Degree	0.042	0.120
Expected Level of Education: Master's	0.078	0.028
Expected Level of Education: Undecided	-0.140	-0.051
High School Characteristics		
High School Average Math MCAS Score	-0.283	-0.044
High School Average English MCAS Score	-0.181	-0.003
High School Average GPA	-0.277	0.025
High School College-Going Rate	-0.094	0.025
Outcome: Credit Accumulation		
Demographics		
Age	0.082	-0.039
Female	0.203	-0.043
Ever English Language Learner	0.112	-0.018
Free/Reduced-Price Lunch Eligible	0.375	0.046
High Incidence Disability	-0.048	0.063
Low Incidence Disability	0.087	0.031
Black	0.175	-0.024
White	-0.376	-0.016
Asian / Pacific Islander	-0.029	0.118

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Hispanic	0.139	-0.054
Other/Mixed	-0.026	0.040
Native	0.003	-0.034
Achievement in High School		
SAT (2400)	-0.303	-0.007
MCAS English Score	-0.246	-0.046
MCAS Math Score	-0.037	-0.018
GPA	0.031	0.038
Number of Advanced Courses	0.173	-0.067
Took Any Advanced Course	0.246	-0.029
Took Math MCAS by Grade 10	-0.028	0.068
Took English MCAS after Grade 10	0.082	-0.015
Behavioral		
Absenteeism	0.024	-0.006
Number of Suspensions	-0.068	-0.040
Number of Activities	0.195	-0.032
Had a Paid Job in High School	0.055	-0.020
Spoke with Parent about Postsecondary Plans by Grade 8	0.013	-0.035
Spoke with an Organization about Postsecondary Plans	0.062	0.000
Felt Prepared for College	-0.132	-0.040
Expected Level of Education: High School	0.043	-0.005
Expected Level of Education: Associate's Degree	0.044	0.019
Expected Level of Education: Bachelor's Degree	0.035	0.110
Expected Level of Education: Master's	0.083	0.055
Expected Level of Education: Undecided	-0.142	-0.065
High School Characteristics		
High School Average Math MCAS Score	-0.272	-0.045
High School Average English MCAS Score	-0.172	0.004
High School Average GPA	-0.274	0.027
High School College-Going Rate	-0.090	0.030
Outcome: FAFSA Renewal		
Demographics		
Age	0.110	-0.021
Female	0.159	-0.141
Ever English Language Learner	0.102	-0.043
Free/Reduced-Price Lunch Eligible	0.370	0.037
High Incidence Disability	-0.047	0.110
Low Incidence Disability	0.091	0.068
Black	0.168	-0.017
White	-0.385	-0.034
Asian / Pacific Islander	-0.030	0.113
Hispanic	0.159	-0.044
Other/Mixed	-0.037	0.018
Native	0.001	-0.044
Achievement in High School		
SAT (2400)	-0.278	0.024
MCAS English Score	-0.249	-0.069
MCAS Math Score	0.003	0.005
GPA	0.023	0.013
Number of Advanced Courses	0.225	0.035
Took Any Advanced Course	0.288	0.067
Took Math MCAS by Grade 10	-0.036	0.049
Took English MCAS after Grade 10	0.090	-0.017

Matching Variables	Standardized Difference Before Matching	Standardized Difference After Matching
Behavioral		
Absenteeism	0.026	-0.004
Number of Suspensions	-0.062	-0.027
Number of Activities	0.249	0.023
Had a Paid Job in High School	0.084	-0.008
Spoke with Parent about Postsecondary Plans by Grade 8	0.000	-0.078
Spoke with an Organization about Postsecondary Plans	0.082	0.013
Felt Prepared for College	-0.141	-0.018
Expected Level of Education: High School	0.072	0.056
Expected Level of Education: Associate's Degree	0.062	0.052
Expected Level of Education: Bachelor's Degree	0.063	0.166
Expected Level of Education: Master's	0.099	0.012
Expected Level of Education: Undecided	-0.096	-0.028
High School Characteristics		
High School Average Math MCAS Score	-0.222	-0.017
High School Average English MCAS Score	-0.094	0.026
High School Average GPA	-0.255	0.030
High School College-Going Rate	-0.051	0.036

Appendix B. Details About the Estimation of Effects and Sensitivity Analyses

B.1 Analytic Approach for Estimating the Average Impact of the Program

To address the primary research question about the impact of SBC on all students, we estimated the following model with the full analytic sample (all SBC students and matched comparison students from the two cohorts with valid data):

$$(1) \qquad Y_{ij} = \pi_0 + \pi_1 T_{ij} + \sum_{b=1}^{B-1} \pi_{(1+b)} I_{ij}^{b} + \sum_{n=1}^{N} \pi_{(B+n)} X_{ij}^{n} + \varepsilon_{ij}$$

where:

Y_{ij} = outcome measure for student *i* in matching block *j*.

T_{ij} = treatment indicator for student *i* in block *j*, which equals one if student *i* is an SBC student and zero otherwise.

I_{ij}^{b} =indicator variable for the b-th matching block for student *i*. It equals one if student *i* is a member of the b-th block and zero otherwise. As described above, for all students attending an college except UMass Boston, a matching block was defined by the college and cohort. Students attending UMass Boston were placed in two blocks (one for each cohort).

X_{ij}^{n} =n-th matching characteristic or covariate for student *i* in block *j*. Similar to the propensity score models, missing values of the covariates were addressed using the dummy variable method.[33]

ε_{ij} = random error term for student *i* in school *j*, which is assumed to be normally distributed with mean zero and variance of σ_{ε}^{2}.

This model was estimated separately for each outcome measure using the matching weights specific to each outcome measure. Since treatment students and potential comparison students with missing outcome data were not included in the matching process, they were not included in the estimation of the effects. In the estimated mode, the coefficient estimate on the treatment indicator, π_1, was interpreted as the average impact of participating in SBC coaching.

Two aspects of the model in Equation 1 are worthy of further explanation. First, the model does not include a separate random error term for college to capture potential clustering of outcome measures within colleges, because we anticipate that such clustering (i.e., the dependence of outcomes of students from the same college) will be fully explained by the matching block indicators already

[33] Free/reduced-price lunch and GPA baseline covariates are identified as primary by the U.S. Department of Education's What Works Clearinghouse, and therefore were not imputed using the dummy variable method. Students missing values on either of these two covariates are dropped from the analysis.

included in the model.[34] Similarly, the model will not include a separate indicator for students in the 2013 or 2014 cohort because the block indicators will be cohort specific.

Second, the independent variables of the model included the matching characteristics that were available for all students and used in the matching process (i.e., all matching covariates except the BPS exit survey items). The purpose of this was to increase the precision of the effect estimates (because these covariates were expected to explain some of the residual variance of the outcome measures) and be doubly robust (Bang and Robins 2005; Tan 2006).[35,36] Section B.3 presents results from alternative specifications that did not control for the matching covariates.

B.2 Analytic Approach for Moderation Analyses

As described in Chapters 5 and 6, we examined two types of moderators: (1) pre-treatment moderators that were exogenous (not related to program participation or effects) and available for both the treatment students and comparison students (gender, race/ethnicity, high school GPA, and type of college) and (2) coaching-related factors such as aspects of the student and coach interactions and the implementation index that were potentially endogenous (may be related to program participation and effects) and only available for treatment students. The analytic approach and interpretation of the resulting relationships between program effects and the moderators differed for the two groups, which is described in detail below.

Specifically, we examined the extent to which program effects were related to exogenous moderators using a slightly modified version of the impact model in Equation 1 to include the interaction of the treatment indicator T_{ij} and the moderator that is being tested. To simplify the analyses and ease the interpretation of the results, we transformed the continuous and categorical moderators into binary variables. Specifically, when examining race/ethnicity, we created a binary moderator "underrepresented students in postsecondary education," which was set to 1 for African American, Hispanic, and Native American students and 0 for the remaining students. When examining high school GPA, the binary mediator "higher high school GPA" was set to 1 for those whose high school GPA was greater than 2.93 and 0 for the remaining students. The modified version of the impact model that included the interaction term was specified as follows:

$$(2) \qquad Y_{ij} = \pi_0 + \pi_1 T_{ij} + \pi_2 T_{ij} M_{ij} + \sum_{b=1}^{B-1} \pi_{(2+b)} I_{ij}^{b} + \sum_{n=1}^{N} \pi_{(1+B+n)} X_{ij}^{n} + \varepsilon_{ij}$$

[34] We tested the validity of this assumption by estimating hierarchical linear models (HLMs) that nest students within colleges. The variance of the college random effect was essentially zero for all outcome measures, and the HLMs yielded very similar estimates to the single-level model in Equation 1.

[35] Using the baseline characteristics in the matching process, and also using them as covariates in the estimation of impacts is deemed to give the analyst two chances to get the "right" model specification (once in the propensity model and once in the impact model for the outcome measure). Therefore, these estimators are called "doubly robust."

[36] We considered using a second set of covariates that were measured post high school and potentially associated with the outcomes of interest such as the location of students' residencies during college (on or off campus, near or far from campus) and whether they held an on-campus job. We decided not to use them, as we were not confident they were exogenous (not influenced by participating in SBC coaching).

In Equation 2, M_{ij} denotes the binary moderator. As an example, assume that M_{ij} was an indicator for female students (=1 if student i was female and =0 if student i was male). In this case, the estimate of π_1 captures the effect estimate for male students, and the estimate of π_2 captures the difference in the estimated effects between females and males. The effect estimate for females can be calculated by adding the two coefficients.

Because the moderators in the first group were either time-invariant or measured before the receipt of treatment and the balance of the treatment and comparison groups within each subgroup was similar to the balance for the full sample,[37] we deem the internal validity (i.e., bias) of the resulting effects for the subgroups to be as strong as those of the full sample and the difference in the effects between the subgroups can be attributed to the moderator of interest.

We had to adopt a different strategy for the second type of moderators, because they were not defined for the matched comparison students. Similar to the exogenous moderators, we first created binary indicators for each endogenous moderator. For example, the value of the "higher academic focus" moderator was set to 1 for the treatment students who had more than four meetings with their coach and 0 for the remaining students. We then estimated the model in Equation 1 with the treatment students with a particular value of the binary moderator and their matched comparison students (with modified weights for the matched comparison students), which yielded the effect estimate specific to that subgroup (e.g., higher academic focus) and estimated another model for the remaining treatment students and their matched comparison students (e.g., lower academic focus). We tested the statistical significance of the difference between the subgroups effects via a Wald test.

Similar to the exogenous moderators, the treatment and matched comparison groups in the subgroups based on the endogenous moderators were balanced. Therefore, we have confidence that the estimated subgroup effects had high internal validity (i.e., low bias). On the other hand, these moderators reflected aspects of coaching and measured post treatment; therefore, they may have been influenced by the program effects. For example, students who were in the "higher academic focus" subgroup may have had academic struggles initially and lower academic outcomes; consequently, their interactions with the coach may have had a higher academic focus than the students who did not have such struggles and had better outcomes. In this case, the estimated effects may be lower for the students in the higher academic focus subgroup than for the rest of the sample, but this difference should not be attributed to the focus of coaching. Therefore, we recommend caution with the causal interpretation of the analyses conducted with endogenous moderators.

Chapters 5 and 6 of the report showed the estimated subgroup effects, their statistical significance as well as the differences between the subgroup effects and the statistical significance of the differences. Appendix C shows more details for these results, including standard errors of the subgroup effects and sample sizes.

B.3 Robustness Checks and Sensitivity Analyses

Recall that the results presented in Chapter 4 for the full sample were produced by the impact model that used all of the matching covariates except the BPS exit survey variables, with the matched comparison group yielded by radius matching. We conducted additional analyses testing the

[37] We do not show the balance statistics for the subgroup analyses, although they are available upon request.

robustness of these results to alternative model specifications, matching methods, and sample definitions. This subsection summarizes the results of these sensitivity analyses.

The first analysis assessed the robustness of the reported results to covariates used in the impact model given in Equation 1. Specifically, we estimated three alternative versions of this model: (1) no matching covariates or matching blocks, (2) with matching blocks but no matching covariates, and (3) with matching blocks and all matching covariates including BPS exit survey variables.[38]

Results are presented in Exhibit B-1. The first panel in this exhibit repeats the results from our preferred specification, whereas the second through fourth panels use the three alternative specifications described above. Exhibit B-1 shows that the magnitudes of the effect estimates were not very sensitive to whether the model included matching blocks or to the set of covariates that were controlled for. The inclusion of additional covariates helps with the precision of effect estimates—standard errors of the preferred specification were about 10 percent lower than those from the model that did not control for any covariates or matching blocks.

Exhibit B-1: Robustness checks, by included covariates

Outcome	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size
Matching Blocks and All Matching Covs Except BPS Exit Survey Vars (Preferred Specification)					
Persistence					
Persistence into Second Year of College	83%	75%	7.88*	2.66	2,512
Persistence into Third Year of College	75%	62%	12.97*	4.54	1,103
Continuous Enrollment	3.43	3.24	0.19*	0.07	2,524
Full-Time Status	72%	65%	6.97*	2.13	1,992
Achievement					
Cumulative GPA	2.45	2.26	0.19*	0.07	1,990
Good Academic Standing	78%	71%	6.99*	2.64	1,992
Semesters Enrolled in Non-Credit-Bearing Courses	0.90	0.95	-0.05	0.05	1,992
Credit Accumulation	39%	36%	3.23*	1.36	1,874
Financial Aid					
FAFSA Renewal	85%	78%	6.87*	2.81	1,811
No Covariates (Alternative Specification 1)					
Persistence					
Persistence into Second Year of College	83%	75%	8.32*	2.85	2,512
Persistence into Third Year of College	75%	61%	13.73*	4.92	1,103
Continuous Enrollment	3.43	3.22	0.21*	0.07	2,524
Full-Time Status	72%	64%	7.49*	2.61	1,992
Achievement					
Cumulative GPA	2.45	2.25	0.20*	0.08	1,990
Good Academic Standing	78%	71%	7.46*	2.87	1,992

[38] Despite being the richest set, we did not choose the third set of covariates as our preferred one because BPS Exit Survey variables were not available for any students from other (non-BPS) districts. For the purposes of these analyses, the missing values are imputed using the dummy variable method.

Outcome	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size
Semesters Enrolled in Non-Credit-Bearing Courses	0.90	0.93	-0.03	0.08	1,992
Credit Accumulation	39%	36%	3.71*	1.62	1,874
Financial Aid					
FAFSA Renewal	85%	77%	7.29*	3.08	1,811
No Covariates, Controlling for Matching Blocks (Alternative Specification 2)					
Persistence					
Persistence into Second Year of College	83%	75%	8.32*	2.79	2,512
Persistence into Third Year of College	75%	61%	13.73*	4.86	1,103
Continuous Enrollment	3.43	3.22	0.21*	0.07	2,524
Full-Time Status	72%	64%	7.49*	2.21	1,992
Achievement					
Cumulative GPA	2.45	2.25	0.20*	0.08	1,990
Good Academic Standing	78%	71%	7.46*	2.80	1,992
Semesters Enrolled in Non-Credit-Bearing Courses	0.90	0.93	-0.03	0.05	1,992
Credit Accumulation	39%	36%	3.71*	1.49	1,874
Financial Aid					
FAFSA Renewal	85%	77%	7.24*	2.96	1,811
Full Set of Covariates (Alternative Specification 3)					
Persistence					
Persistence into Second Year of College	83%	75%	7.70*	2.50	2,512
Persistence into Third Year of College	75%	63%	12.65*	3.94	1,103
Continuous Enrollment	3.43	3.24	0.19*	0.06	2,524
Full-Time Status	72%	65%	7.14*	1.95	1,992
Achievement					
Cumulative GPA	2.45	2.26	0.19*	0.07	1,990
Good Academic Standing	78%	71%	7.26*	2.47	1,992
Semesters Enrolled in Non-Credit-Bearing Courses	0.90	0.96	-0.06	0.05	1,992
Credit Accumulation	39%	36%	3.57*	1.30	1,874
Financial Aid					
FAFSA Renewal	85%	78%	6.76*	2.57	1,811

Exhibit B-2 shows the estimated program effects using nearest neighbor matching with the different covariate sets. The two matching methods with the preferred set of covariates (matching blocks and all matching covariates without BPS Exit Survey variables) yielded very similar effect estimates and substantive conclusions. For all outcomes, standard errors for radius matching were smaller than nearest neighbor matching, reflecting the differences in the sample sizes. For only one outcome—persistence into the third year of college—did nearest neighbor matching yield a larger effect estimate than radius matching (18 percent compared with 13 percent). The other panels in Exhibit B-2 are consistent with Exhibit B-1; that is, inclusion of each set of additional covariates marginally improves the precision of the effect estimates while not changing their magnitudes.

Exhibit B-2: Robustness checks using nearest neighbor matching and different covariates

Outcome	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size
No Covariates (Alternative Specification 1)					
Persistence					
Persistence into Second Year of College	83%	75%	8.28*	3.02	1,490
Persistence into Third Year of College	75%	58%	17.55*	5.14	661
Continuous Enrollment	3.43	3.21	0.22*	0.08	1,490
Full-Time Status	72%	65%	6.89*	2.74	1,287
Achievement					
Cumulative GPA	2.45	2.26	0.19*	0.09	1,287
Good Academic Standing	78%	71%	7.16*	3.02	1,287
Semesters Enrolled in Non-Credit-Bearing Courses	0.90	0.95	-0.05	0.08	1,287
Credit Accumulation	39%	36%	3.24	1.71	1,199
Financial Aid					
FAFSA Renewal	85%	77%	7.24*	3.29	1,146
No Covariates, Controlling for Matching Blocks (Alternative Specification 2)					
Persistence					
Persistence into Second Year of College	83%	75%	8.28*	2.95	1,490
Persistence into Third Year of College	75%	58%	17.55*	5.09	661
Continuous Enrollment	3.43	3.21	0.22*	0.07	1,490
Full-Time Status	72%	65%	6.89*	2.30	1,287
Achievement					
Cumulative GPA	2.45	2.26	0.19*	0.08	1,287
Good Academic Standing	78%	71%	7.16*	2.95	1,287
Semesters Enrolled in Non-Credit-Bearing Courses	0.90	0.95	-0.05	0.06	1,287
Credit Accumulation	39%	36%	3.24*	1.60	1,199
Financial Aid					
FAFSA Renewal	85%	77%	7.24*	3.20	1,146
Matching Blocks and All Matching Covs Except BPS Exit Survey Vars (Preferred Specification)					
Persistence					
Persistence into Second Year of College	83%	75%	7.70*	2.80	1,490
Persistence into Third Year of College	75%	58%	17.11*	4.79	661
Continuous Enrollment	3.43	3.23	0.20*	0.07	1,490
Full-Time Status	72%	65%	6.49*	2.19	1,287
Achievement					
Cumulative GPA	2.45	2.27	0.18*	0.08	1,287
Good Academic Standing	78%	72%	6.87*	2.74	1,287
Semesters Enrolled in Non-Credit-Bearing Courses	0.90	0.97	-0.07	0.06	1,287
Credit Accumulation	39%	37%	2.89*	1.44	1,199
Financial Aid					
FAFSA Renewal	85%	78%	6.99*	3.05	1,146
Full Set of Covariates (Alternative Specification 3)					
Persistence					
Persistence into Second Year of College	83%	76%	7.13*	2.64	1,490

Outcome	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size
Persistence into Third Year of College	75%	58%	16.69*	4.26	661
Continuous Enrollment	3.43	3.23	0.20*	0.07	1,490
Full-Time Status	72%	65%	6.60*	2.04	1,287
Achievement					
Cumulative GPA	2.45	2.27	0.18*	0.07	1,287
Good Academic Standing	78%	71%	6.96*	2.57	1,287
Semesters Enrolled in Non-Credit-Bearing Courses	0.90	0.98	-0.08	0.05	1,287
Credit Accumulation	39%	36%	3.17*	1.39	1,199
Financial Aid					
FAFSA Renewal	85%	78%	6.68*	2.82	1,146

Finally, Exhibit B-3 shows the effect estimates for three outcomes obtained from NSC with the reduced sample that includes only students from the nine colleges in the college administrative dataset. These estimates are very similar to the estimates obtained with the full sample.

Exhibit B-3: National Student Clearinghouse outcomes for college administrative data sample

Outcome	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size
Persistence					
Persistence into Second Year of College	83%	75%	8.41*	2.84	1,985
Persistence into Third Year of College	75%	63%	12.75*	4.77	936
Continuous Enrollment	3.45	3.24	0.21*	0.07	1,976

Appendix C. Variation across Student Characteristics and Features of Coaching, All Outcomes

Exhibit C-1: Impacts by gender

Outcome	Females					Males					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	86%	78%	8.24*	3.46	1,375	79%	72%	7.34	3.86	1,137	0.90
Persistence into Third Year of College	85%	59%	26.07*	6.06	594	62%	67%	-5.33	5.54	509	31.40*
Continuous Enrollment	3.50	3.30	0.22*	0.09	1,393	3.30	3.20	0.16	0.09	1,131	0.06
Full-Time Status	76%	68%	8.40*	3.02	1,054	66%	61%	4.84	2.58	938	3.56
Achievement											
Cumulative GPA	2.60	2.30	0.31*	0.10	1,054	2.20	2.20	0.00	0.09	936	0.31*
Good Academic Standing	83%	74%	8.87*	3.53	1,054	72%	68%	4.18	3.59	938	4.69
Semesters Enrolled in Non-Credit-Bearing Courses	0.99	0.91	0.08	0.06	1,054	0.77	1.03	-0.26*	0.07	938	0.34*
Credit Accumulation	41%	36%	5.27*	1.76	997	37%	37%	0.19	2.00	877	5.08
Financial Aid											
FAFSA Renewal	88%	82%	5.62	3.37	951	80%	72%	8.74	4.61	860	-3.12

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), and college administrative data.
* Indicates statistical significance at the 5 percent level

Exhibit C-2: Impacts by race/ethnicity

Outcome	Under Represented					Not Under Represented					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	80%	73%	7.26*	3.14	1,655	95%	85%	10.20*	4.39	857	-2.94
Persistence into Third Year of College	71%	60%	11.12*	5.34	750	91%	72%	19.36*	7.66	353	-8.24
Continuous Enrollment	3.30	3.20	0.17*	0.08	1,664	3.80	3.50	0.28*	0.12	860	-0.11
Full-Time Status	67%	60%	6.58*	2.53	1,340	90%	82%	8.39*	3.18	652	-1.81
Achievement											
Cumulative GPA	2.30	2.20	0.17*	0.08	1,338	2.80	2.60	0.26	0.14	652	-0.09
Good Academic Standing	75%	68%	6.10*	3.10	1,340	91%	81%	10.31*	4.35	652	-4.21
Semesters Enrolled in Non-Credit-Bearing Courses	0.96	0.98	-0.02	0.06	1,340	0.71	0.89	-0.18	0.12	652	0.16
Credit Accumulation	38%	35%	2.63	1.59	1,248	45%	40%	5.37*	2.47	626	-2.74
Financial Aid											
FAFSA Renewal	83%	77%	5.92	3.33	1,198	91%	81%	10.14*	4.93	613	-4.22

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), and college administrative data.
* Indicates statistical significance at the 5 percent level

Exhibit C-3: Impacts by high school GPA

Outcome	High GPA					Low GPA					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	93%	84%	8.62*	2.97	1,136	76%	69%	7.32*	3.29	1,376	1.30
Persistence into Third Year of College	88%	71%	16.83*	5.57	489	65%	55%	9.82	5.40	614	7.01
Continuous Enrollment	3.70	3.50	0.20*	0.08	1,140	3.20	3.00	0.19*	0.08	1,384	0.01
Full-Time Status	84%	76%	7.36*	2.76	869	63%	56%	6.66*	2.29	1,123	0.70
Achievement											
Cumulative GPA	2.80	2.60	0.25*	0.08	869	2.10	2.00	0.15	0.09	1,121	0.10
Good Academic Standing	90%	81%	8.94*	2.88	869	69%	64%	5.47	3.26	1,123	3.47
Semesters Enrolled in Non-Credit-Bearing Courses	0.68	0.82	-0.14*	0.07	869	1.07	1.06	0.01	0.06	1,123	-0.15
Credit Accumulation	46%	41%	4.42*	1.53	830	35%	32%	2.32	1.70	1,044	2.10
Financial Aid											
FAFSA Renewal	89%	83%	6.04	3.13	801	81%	74%	7.48*	3.38	1,010	-1.44

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), and college administrative data.
* Indicates statistical significance at the 5 percent level

Exhibit C-4 Impacts by college type

Outcome	2-Year					4-Year					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	67%	64%	2.59	3.70	980	93%	82%	11.11*	3.60	1,532	-8.52
Persistence into Third Year of College	53%	51%	1.53	6.13	469	90%	69%	20.39*	6.17	634	-18.86*
Continuous Enrollment	3.00	2.90	0.08	0.09	979	3.70	3.40	0.26*	0.09	1,545	-0.18
Full-Time Status	42%	38%	4.66	2.53	870	90%	82%	8.39*	3.06	1,122	-3.73
Achievement											
Cumulative GPA	2.10	2.00	0.08	0.08	868	2.70	2.40	0.25*	0.10	1,122	-0.17
Good Academic Standing	65%	62%	3.20	3.11	870	86%	77%	9.33*	3.76	1,122	-6.13
Semesters Enrolled in Non-Credit-Bearing Courses	1.61	1.62	-0.01	0.08	870	0.46	0.54	-0.08	0.07	1,122	0.07
Credit Accumulation	41%	38%	2.92	2.21	822	39%	35%	3.44*	1.70	1,052	-0.52
Financial Aid											
FAFSA Renewal	68%	68%	0.06	4.10	808	96%	85%	11.64*	3.76	1,003	-11.58*

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), and college administrative data.
* Indicates statistical significance at the 5 percent level

Exhibit C-5: Impacts by number of coaching interactions covering academic topics

Outcome	High Academic Focus					Low Academic Focus					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	87%	77%	10.71*	2.95	1,881	79%	74%	5.58	3.23	1,934	5.13
Persistence into Third Year of College	83%	63%	19.83*	6.16	719	72%	62%	10.41*	4.70	987	9.42
Continuous Enrollment	3.60	3.30	0.33*	0.08	1,885	3.30	3.20	0.11	0.08	1,946	0.22
Full-Time Status	78%	68%	10.04*	2.18	1,599	66%	61%	5.11	2.72	1,614	4.93
Achievement											
Cumulative GPA	2.50	2.30	0.28*	0.08	1,597	2.40	2.30	0.12	0.09	1,612	0.16
Good Academic Standing	84%	72%	11.96*	2.91	1,599	73%	70%	2.91	3.21	1,614	9.05*
Semesters Enrolled in Non-Credit-Bearing Courses	0.86	0.84	0.02	0.06	1,599	0.94	1.05	-0.11	0.07	1,614	0.13
Credit Accumulation	42%	36%	6.00*	1.57	1,517	37%	36%	1.44	1.79	1,505	4.56
Financial Aid											
FAFSA Renewal	85%	79%	6.26*	3.12	1,464	84%	76%	8.14*	3.31	1,513	-1.88

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), college administrative data, and Program database data collected from the coaching organizations.
* Indicates statistical significance at the 5 percent level

Exhibit C-6: Impacts by number of coaching interactions covering financial aid topics

Outcome	High Financial Aid Focus					Low Financial Aid Focus					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	89%	75%	13.98*	3.05	1,671	79%	75%	4.00	3.09	2,051	9.98*
Persistence into Third Year of College	91%	65%	26.66*	5.55	585	68%	61%	6.81	4.94	986	19.85*
Continuous Enrollment	3.60	3.20	0.34*	0.08	1,680	3.30	3.20	0.12	0.08	2,056	0.22
Full-Time Status	79%	66%	12.59*	2.39	1,381	68%	64%	3.94	2.44	1,717	8.65*
Achievement											
Cumulative GPA	2.60	2.30	0.34*	0.08	1,380	2.40	2.30	0.10	0.08	1,715	0.24*
Good Academic Standing	86%	70%	15.73*	2.96	1,381	74%	72%	1.65	3.03	1,717	14.08*
Semesters Enrolled in Non-Credit-Bearing Courses	0.89	0.93	-0.04	0.07	1,381	0.91	0.96	-0.05	0.06	1,717	0.01
Credit Accumulation	41%	34%	7.54*	1.62	1,294	38%	37%	1.19	1.70	1,617	6.35*
Financial Aid											
FAFSA Renewal	91%	79%	11.65*	3.17	1,248	81%	76%	5.11	3.24	1,590	6.54

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), college administrative data, and Program database data collected from the coaching organizations.
* Indicates statistical significance at the 5 percent level

Exhibit C-7: Impacts by number of coaching interactions covering managing life responsibilities

Outcome	High General Life Focus					Low General Life Focus					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	82%	73%	9.72*	3.04	1,922	84%	77%	6.53*	3.11	1,954	3.19
Persistence into Third Year of College	78%	61%	16.88*	5.51	827	74%	64%	9.89	5.17	934	6.99
Continuous Enrollment	3.40	3.20	0.24*	0.07	1,940	3.50	3.30	0.19*	0.08	1,947	0.05
Full-Time Status	66%	58%	8.33*	2.33	1,565	77%	70%	6.94*	2.56	1,651	1.39
Achievement											
Cumulative GPA	2.40	2.20	0.19*	0.08	1,563	2.50	2.30	0.20*	0.09	1,649	-0.01
Good Academic Standing	78%	69%	9.33*	2.97	1,565	79%	73%	5.81	3.17	1,651	3.52
Semesters Enrolled in Non-Credit-Bearing Courses	0.97	1.03	-0.06	0.06	1,565	0.84	0.87	-0.03	0.06	1,651	-0.03
Credit Accumulation	41%	36%	5.61*	1.79	1,497	38%	36%	2.20	1.63	1,548	3.41
Financial Aid											
FAFSA Renewal	80%	76%	4.37	3.27	1,448	89%	79%	9.76*	3.31	1,512	-5.39

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), college administrative data, and Program database data collected from the coaching organizations.
* Indicates statistical significance at the 5 percent level

Exhibit C-8: Impacts by number of coaching interactions covering career topics

Outcome	High Career Focus					Low Career Focus					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	88%	73%	14.67*	3.46	1,706	81%	76%	5.45	2.88	2,194	9.22*
Persistence into Third Year of College	80%	60%	20.54*	6.11	788	73%	64%	9.25*	4.72	995	11.29
Continuous Enrollment	3.60	3.20	0.39*	0.09	1,718	3.40	3.20	0.14*	0.07	2,205	0.25*
Full-Time Status	75%	60%	14.77*	2.77	1,455	71%	66%	4.39	2.25	1,793	10.38*
Achievement											
Cumulative GPA	2.70	2.20	0.43*	0.09	1,453	2.40	2.30	0.09	0.08	1,791	0.34*
Good Academic Standing	85%	70%	15.69*	3.22	1,455	76%	72%	3.80	2.91	1,793	11.89*
Semesters Enrolled in Non-Credit-Bearing Courses	0.88	1.04	-0.16*	0.07	1,455	0.90	0.90	0.00	0.06	1,793	-0.16
Credit Accumulation	45%	35%	10.63*	1.95	1,355	37%	36%	0.70	1.53	1,687	9.93*
Financial Aid											
FAFSA Renewal	85%	77%	8.49*	3.79	1,355	84%	78%	6.87*	2.94	1,636	1.62

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), college administrative data, and Program database data collected from the coaching organizations.
* Indicates statistical significance at the 5 percent level

Exhibit C-9: Impacts by frequency of coaching interactions

Outcome	High Frequency					Low Frequency					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	88%	75%	12.57*	3.41	1,923	79%	75%	3.75	3.01	1,966	8.82
Persistence into Third Year of College	88%	66%	22.21*	5.76	863	61%	58%	2.34	5.13	873	19.87*
Continuous Enrollment	3.60	3.30	0.32*	0.09	1,931	3.30	3.20	0.10	0.08	1,971	0.22
Full-Time Status	78%	67%	11.22*	2.78	1,629	66%	62%	3.78	2.31	1,624	7.44*
Achievement											
Cumulative GPA	2.60	2.30	0.29*	0.10	1,627	2.40	2.30	0.11	0.08	1,622	0.18
Good Academic Standing	84%	71%	12.47*	3.39	1,629	74%	71%	2.32	2.95	1,624	10.15*
Semesters Enrolled in Non-Credit-Bearing Courses	0.87	0.90	-0.03	0.07	1,629	0.93	0.99	-0.06	0.07	1,624	0.03
Credit Accumulation	41%	35%	5.72*	1.84	1,518	38%	37%	1.60	1.65	1,537	4.12
Financial Aid											
FAFSA Renewal	88%	78%	10.05*	3.61	1,496	82%	77%	5.04	3.11	1,501	5.01

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), college administrative data, and Program database data collected from the coaching organizations.
* Indicates statistical significance at the 5 percent level

Exhibit C-10: Impacts by duration of one-on-one coaching interactions

Outcome	High Duration					Low Duration					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	89%	77%	12.32*	3.12	1,842	78%	74%	4.21	3.06	2,054	8.11
Persistence into Third Year of College	85%	64%	20.71*	5.63	807	70%	61%	8.32	4.92	975	12.39
Continuous Enrollment	3.60	3.30	0.32*	0.08	1,844	3.30	3.20	0.11	0.08	2,067	0.21
Full-Time Status	80%	70%	10.14*	2.52	1,606	65%	60%	4.99*	2.40	1,635	5.15
Achievement											
Cumulative GPA	2.60	2.30	0.31*	0.09	1,604	2.30	2.20	0.08	0.08	1,633	0.23
Good Academic Standing	84%	73%	10.72*	3.12	1,606	73%	69%	3.96	3.06	1,635	6.76
Semesters Enrolled in Non-Credit-Bearing Courses	0.76	0.80	-0.04	0.06	1,606	1.04	1.08	-0.04	0.07	1,635	0.00
Credit Accumulation	42%	35%	6.55*	1.57	1,522	37%	37%	0.83	1.87	1,546	5.72*
Financial Aid											
FAFSA Renewal	88%	80%	7.93*	3.21	1,488	81%	75%	6.37	3.34	1,512	1.56

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), college administrative data, and Program database data collected from the coaching organizations.
* Indicates statistical significance at the 5 percent level

Exhibit C-11: Impacts by implementation index score

Outcome	High Implementation Index Score					Low Implementation Index Score					Difference
	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	Treatment Group Mean	Adjusted Comparison Group Mean	Program Impact	Standard Error	Sample Size	
Persistence											
Persistence into Second Year of College	84%	74%	9.93*	3.99	1,511	83%	75%	7.46*	2.83	2,218	2.47
Persistence into Third Year of College	75%	61%	14.29*	6.80	748	75%	63%	12.27*	4.84	958	2.02
Continuous Enrollment	3.30	3.20	0.09	0.10	1,516	3.50	3.20	0.24*	0.07	2,229	-0.15
Full-Time Status	65%	61%	4.70	3.42	1,235	73%	66%	7.88*	2.24	1,853	-3.18
Achievement											
Cumulative GPA	2.40	2.30	0.14	0.11	1,234	2.50	2.30	0.20*	0.08	1,851	-0.06
Good Academic Standing	75%	71%	4.75	4.24	1,235	79%	71%	7.74*	2.78	1,853	-2.99
Semesters Enrolled in Non-Credit-Bearing Courses	0.90	0.90	-0.01	0.09	1,235	0.90	1.00	-0.06	0.06	1,853	0.05
Credit Accumulation	40%	36%	4.39	2.48	1,167	39%	36%	3.27*	1.48	1,744	1.12
Financial Aid											
FAFSA Renewal	84%	75%	8.89*	4.29	1,218	85%	78%	6.67*	2.94	1,676	2.22

Source: Data sources include National Student Clearinghouse (NSC) from both Boston Public Schools (BPS) and the Massachusetts Department of Elementary and Secondary Education (MA DESE), college administrative data, and Program database data collected from the coaching organizations.
* Indicates statistical significance at the 5 percent level

References

Arnold, K., S. Fleming, M. DeAnda, B. Castleman, and K. L. Wartman. 2009. "The Summer Flood: The Invisible Gap among Low-Income Students." *Thought & Action*, Fall: 23–34.

Arnold, Karen D., Elissa C. Lu, and K. J. Armstrong. 2012. "The Ecology of College Readiness." *ASHE Higher Education Reports*, 38 (5). San Francisco: Jossey-Bass.

Aud, S., W. Hussar, F. Johnson, G. Kena, E. Roth, E. Manning, X. Wang, & J. Zhang. 2012. *The Condition of Education 2012*. NCES Report 2012-045. Washington, DC : U.S. Department of Education, National Center for Education Statistics. Retrieved December 7, 2016 from http://nces.ed.gov/pubsearch

Avery, C., J. Howell, and L. Page. 2014. *A Review of the Role of College Counseling, Coaching, and Mentoring on Students' Postsecondary Outcomes.* New York: College Board Research.

Avery, C., and T. J. Kane. 2004. "Student Perceptions of College Opportunities. The Boston COACH Program." In *College Choices: The Economics of Where to Go, When to Go, and How to Pay for It*, edited by C. Hoxby: 355–394. Chicago: University of Chicago Press.

Ayala, C., and A. Striplen. 2002. "A Career introduction Model for First-Generation College Freshmen Students" (ERIC ED469996). In *Thriving in Challenging and Uncertain Times*, edited by Garry R. Walz, Richard Knowdell, and Chris Kirkman: 57–62. Greensboro, NC: ERIC Clearinghouse on Counseling and Student Services.

Bahr, P. R. 2008. "Does Mathematics Remediation Work? A Comparative Analysis of Academic Attainment among Community College Students." *Research in Higher Education* 49 (5): 420–450.

Bailey, M.J., and S.M. Dynarski. 2011. "Gains and Gaps: Changing Inequality in U.S. College Entry and Completion." *In Whither Opportunity? Rising Inequality and the Uncertain Life Chances of Low-Income Children*, edited by G. J. Duncan and R. J. Murnane: 117–132. New York: Russell Sage.

Bailey, T., D. W. Jeong, and S. Cho. 2010. "Referral, Enrollment, and Completion in Developmental Education Sequences in Community Colleges." *Economics of Education Review*, 29 (2): 255-270.

Bang, H., and J.M. Robins. 2005. "Doubly Robust Estimation in Missing Data and Causal Inference Models." *Biometrics*, 61: 962–972.

Baum, S., J. Ma, and K. Payea. 2010. *Education Pays: The Benefits of Higher Education for Individuals and Society*. New York: College Board.

Belfield, C. R., and P. M. Crosta. 2012. "Predicting Success in College: The Importance of Placement Tests and High School Transcripts." CCRC Working Paper No. 42. New York: Community College Research Center, Columbia University.

Benjamini, Y., and Y. Hochberg. 1995. "Controlling the False Discovery Rate: A Practical and Powerful Approach to Multiple Testing." *Journal of the Royal Statistical Society*, Series B (Methodological): 289–300.

Bettinger, E. P., A. Boatman, and B. T. Long. 2013. "Student Supports: Developmental Education and Other Academic Programs." *The Future of Children*, 23 (1): 93–115.

Bettinger, E. P., and R. Baker. 2014. "The Effects of Student Coaching An Evaluation of a Randomized Experiment in Student Advising." *Educational Evaluation and Policy Analysis*, 36 (1): 3–19.

Bettinger, E., B.T. Long, P. Oreopoulos, and L. Sanbonmatsu. 2012. "The Role of Application Assistance and Information in College Decisions: Results from the H&R Block FAFSA Experiment." *Quarterly Journal of Economics*, 127: 1205–1242.

Bifulco, R. 2012. "Can Nonexperimental Estimates Replicate Estimates Based on Random Assignment in Evaluations of School Choice? A Within-Study Comparison." *Journal of Policy Analysis and Management*, 31 (3): 729–775.

Bird, K., and B. L. Castleman. 2016. "Here Today, Gone Tomorrow? Investigating Rates and Patterns of Financial Aid Renewal among College Freshmen." *Research in Higher Education*, 57 (4): 395–422.

Bozick, R., and S. DeLuca. 2011. "Not Making the Transition to College: School, Work, and Opportunities in the Lives of American Youth." *Social Science Research*, 40: 1249–1262.

Bureau of Labor Statistics (BLS). 2017. Employment Projections. Washington, DC: Bureau of Labor Statistics. Retrieved February 13, 2017 from https://data.bls.gov/projections/occupationProj

Caliendo, M., and S. Koepening. 2008. "Some Practical Guidance for the Implementation of Propensity Score Matching." *Journal of Economic Surveys*, 22 (10): 31–72.

Carlstrom, A., and M.A. Miller, eds. 2013. *NACADA National Survey of Academic Advising.* Monograph No. 25. Manhattan, KS: National Academic Advising Association.

Carnevale, A. P., S.J. Rose, and B. Cheah. 2011. *The College Payoff: Education, Occupations and Lifetime Earnings.* Washington, DC: McCourt School of Public Policy, Center on Education and the Workforce. Retrieved December 7, 2016 from https://cew.georgetown.edu/report/the-college-payoff/

Carnevale, A. P., N. Smith, and J. Strohl. 2013a. *Recovery: Job Growth and Education Requirements through 2020*. Washington, DC: Center on Education and the Workforce, Georgetown University.

Carnevale, A. P., N. Smith, and J. Strohl. 2013b. *Recovery: Job Growth and Education Requirements through 2020, State Report*. Washington, DC: Center on Education and the Workforce, Georgetown University.

Carrell, S.E., and B. Sacerdote. 2013. "Late Interventions Matter Too: The Case of College Coaching New Hampshire." NBER Working Paper 19031. Cambridge, MA: National Bureau of Economic Research.

Castleman, B. L., K. C. Arnold, and K. L. Wartman. 2012. "Stemming the Tide of Summer Melt: An Experimental Study of the Effects of Post-High School Summer Intervention on Low-Income Students' College Enrollment." *Journal of Research on Educational Effectiveness*, 5 (1): 1–17.

Castleman, B. L., and L. C. Page. 2013. "A Trickle or a Torrent? Understanding the Extent of Summer 'Melt' among College-Intending High School Graduates." *Social Science Quarterly*, 95 (1). Retrieved April 17, 2013, from http://onlinelibrary.wiley.com/doi/10.1111/ssqu.12032/pdf

Castleman, B. L., and L. Page. 2015. "Summer Nudging: Can Personalized Text Messages and Peer Mentor Outreach Increase College Going among Low-Income High School Graduates?" *Journal of Economic Behavior & Organization*, 115: 144–160. Retrieved December 7, 2016 from http://www.sciencedirect.com/science/article/pii/S0167268114003217

Castleman, B. L., L. C. Page, and K. Schooley. 2014. "The Forgotten Summer: Does the Offer of College Counseling After High School Mitigate Summer Melt among College-Intending, Low-Income High School Graduates?" *Journal of Policy Analysis and Management*, 33 (2): 320–344.

Clair, T., Cook, T. and K. Hallberg. 2014. "Examining the Internal Validity and Statistical Precision of the Comparative Interrupted Time Series Design by Comparison with a Randomized Experiment." *American Journal of Evaluation*, 35 (3): 311–327.

Cooper, H., B. Nye, K. Charlton, J. Lindsay, and S. Greathouse. 1996. "The Effects of Summer Vacation on Achievement Test Scores: A Narrative and Meta-Analytic Review." *Review of Educational Research*, 66 (3): 227–268.

Crosta, P. 2014. "Intensity and Attachment: How the Chaotic Enrollment Patterns of Community College Students Relate to Educational Outcomes." *Community College Review*, 42: 118–142.

Deming, D., and S.M. Dynarski. 2009. "Into College, Out of Poverty? Policies to Increase the Postsecondary Attainment of the Poor." NBER Working Paper No. 15387. Cambridge, MA: National Bureau of Economic Research.

Dynarski, S. M., Hemelt, S.W. and J.M Hyman. 2013. "The Missing Manual: Using National Student Clearinghouse Data to Track Postsecondary Outcomes." NBER Working Paper No. 19552. Cambridge, MA: National Bureau of Economic Research.

Gallagher, R. P. 2010. *National Survey of Counseling Center Directors: 2010*. Monograph 85. Alexandria, VA: International Association of Counseling Centers.

Greene, J. P. and M.A. Winters. 2005. *Public High School Graduation and College-Readiness Rates: 1991-2002*. Education Working Paper No. 8. Atlanta, GA: Center for Civic Innovation.

Harper, S. R. 2006. *Black Male Students at Public Flagship University in the US: Status, Trends, and Implications for Policy and Practices*. Washington, DC: Joint Center for Political and Economic Studies.

Harper, S. R., and K. A. Griffen. 2011. "Opportunity Beyond Affirmative Action: How Low-Income and Working Class Black Male Achievers Access Highly Selective High-Cost Colleges and Universities." *Harvard Journal of African American Public Policy*, 17 (1): 43–60.

Haskins, R. 2008. "Education and Economic Mobility." In *Getting Ahead or Losing Ground: Economic Mobility in America*, edited by J. B. Isaacs, I. V. Sawhill, and R. Haskins: 91–101. Washington, DC: The Brookings Institution. Retrieved December 7, 2016 from https://www.brookings.edu/wp-content/uploads/2016/06/02_economic_mobility_sawhill.pdf.

Hossler, D., and K. Gallagher. 1987. "Studying Student College Choice: A Three-Phase Model and the Implications for Policymakers." In *College and University*, 62: 207–221.

Hout, M. 2012. "Social and Economic Returns to College Education in the United States." *Annual Review of Sociology*, 38: 379–400.

Hoxby, C., and C. Turner. 2013. "Expanding College Opportunities for High-Achieving, Low Income Students." SIEPR Discussion Paper No. 12-014. Stanford, CA: Stanford Institute for Economic Policy Research.

Isaacs, J. B., I. V. Sawhill, and R. Haskins. 2008. *Getting Ahead or Losing Ground: Economic Mobility in America.* Washington, DC: Brookings Institution.

Johnson, J., and J. Rochkind. 2009. *With Their Whole Lives Ahead of Them: Myths and Realities about Why So Many Students Fail to Finish College. A Report for the Bill and Melinda Gates Foundation*. New York: Public Agenda. Retrieved December 7, 2016 from http://www.publicagenda.org/pages/with-their-whole-lives-ahead-of-them.

Karp, M. M. 2011. "Toward a New Understanding of Non-Academic Student Support: Four Mechanisms Encouraging Positive Student Outcomes in the Community College." CCRC Working Paper No. 28. Assessment of Evidence Series. New York: Community College Research Center, Columbia University.

Kena, G., L. Musu-Gillette, J. Robinson, X. Wang, A. Rathbun, J. Zhang, S. Wilkinson-Flicker, A. Barner, and E. Dunlop Velez. 2015. *The Condition of Education 2015*. NCES Report 2015-144. Washington DC.: U.S. Department of Education, National Center for Education Statistics.

King, Gary, and Richard Nielsen. "Why Propensity Scores Should Not Be Used for Matching." Working Paper. Retrieved December 7, 2016 from http://j.mp/1sexgVw

Linkow, T., K. Dadisman, B. Gamse, H. Didriksen, G. Schwartz, M. Hillard, and M. Karuu. 2015. *Degrees of Coaching. Success Boston's Transition Coaching Model*. Boston, MA: The Boston Foundation. December 7, 2016 from http://www.tbf.org/tbf/55/success-boston/~/media/DDCD414E35514FB0832157DAA4849911.pdf

McLaughlin, J., N. Sullivan, A. Van Eaton, T. Linkow, H. Didriksen, B. Gamse, and J. Furey. 2016, June. *Reaching for the Cap and Gown: Progress Toward Success Boston's College Completion Goals for Graduates of the Boston Public Schools.* Boston, MA: The Boston Foundation. Retrieved December 7, 2016 from https://www.tbf.org/~/media/TBFOrg/Files/Reports/SUCCESS%20BOSTON%20CapGown%202016%20report.pdf

Meara, E. R., S. Richards, and D. M. Cutler. 2008. "The Gap Gets Bigger: Changes in Mortality and Life Expectancy, by Education, 1981–2000." *Health Affairs*, 27 (2): 350–360.

Morgan, Stephen L., and Christopher Winship. *Counterfactuals and Causal Inference*. New York, NY: Cambridge University Press.

National Student Clearinghouse (NSC). 2016. *Snapshot Report – Persistence and Retention.* Washington, DC : U.S. Department of Education, National Center for Education Statistics. Retrieved December 7, 2016 from https://nscresearchcenter.org/snapshotreport-persistenceretention22/

National Center for Education Statistics. 2014. *Profile of Undergraduate Students: 2011-2012.* Washington, DC : U.S. Department of Education, National Center for Education Statistics. Retrieved December 7, 2016 from http://nces.ed.gov/pubs2015/2015167.pdf.

Oreopoulos, P., and U. Petronijevic. 2016. "Student Coaching: How Far Can Technology Go?" NBER Working Paper No. w22630. Cambridge, MA: National Bureau of Economic Research.

Pfeffer, F. T., and F. R. Hertel. 2015. "How Has Educational Expansion Shaped Social Mobility Trends in the United States?" *Social Forces*, 94 (1): 143–180.

Roderick, M., J. Nagaoka, V. Coca, E. Moeller, K. Roddie, J. Gilliam, and D. Patton. 2008. *From High School to the Future: Potholes on the Road to College*. Chicago, IL: Consortium on Chicago School Research.

Rosenbaum, P., and D. Rubin. 1984. "Reducing Bias in Observational Studies Using Subclassification on the Propensity Score." *Journal of the American Statistical Association*, 79 (387): 516–524.

Ross, R., S. White, J. Wright, and L. Knapp. 2013. Using Behavioral Economics for Postsecondary Success. Washington, DC: Ideas 42.

Rubin, D.B. 2001. "Using Propensity Scores to Help Design Observational Studies: Application to the Tobacco Litigation." *Health Services & Outcomes Research Methodology*, 2: 169–188.

Schochet, P. Z. 2008. *Technical Methods Report: Guidelines for Multiple Testing in Impact Evaluations.* Washington DC: Mathematica Policy Research, Inc. Retrieved December 7, 2016 from http://ies.ed.gov/ncee/pdf/20084018.pdf

Scott-Clayton, J. 2011. "The Shapeless River: Does a Lack of Structure Inhibit Students' Progress at Community Colleges?" CCRC Working Paper No. 25. Assessment of Evidence Series. New York, NY: Community College Research Center, Columbia University.

Scrivener, S., and M. J. Weiss. 2009, August. *Opening Doors: More Guidance, Better Results? Three-Year Effects of an Enhanced Student Services Program at Two Community Colleges.* New York, NY: MDRC.

Shapiro, D., A. Dundar, P. K. Wakhungu, X. Yuan, A. Nathan, and Y. Hwang. 2015, November. *Completing College: A National View of Student Attainment Rates – Fall 2009 Cohort.* Signature Report No. 10. Herndon, VA: National Student Clearinghouse Research Center.

Smith, J.A. and Todd P.E. 2005. "Does Matching Overcome Lalonde's Critique of Nonexperimental Estimators?" *Journal of Econometrics*, 125: 305–53.

Steiner, P. M., T.D. Cook, W.R. Shadish, & M.H. Clark. 2010. "The Importance of Covariate Selection in Controlling for Selection Bias in Observational Studies." *Psychological Methods*, 15(3): 250–267.

Steiner, P. M., T. D. Cook, and W. R. Shadish. 2011. "On the Importance of Reliable Covariate Measurement in Selection Bias Adjustments Using Propensity Scores." *Journal of Educational and Behavioral Statistics*, 36 (2): 213–236.

Stephan, J. L., and J. E. Rosenbaum. 2013. "Can High Schools Reduce College Enrollment Gaps with a New Counseling Model?" *Educational Evaluation and Policy Analysis*, 35 (2): 200–219.

Stephens, N. M., T. N. Brannon, H. R. Markus, and J. E. Nelson. 2015. "Feeling at Home in College: Fortifying School-Relevant Selves to Reduce Social Class Disparities in Higher Education." *Social Issues and Policy Review*, 9 (1): 1–24.

Stuart, Elizabeth A. 2010. "Matching Methods for Causal Inference: A Review and a Look Forward." *Statistical Science*, 25(1): 1–21.

Sum, A., I. Khatiwada, W. McHugh, and S. Palma. 2013. *Getting Closer to the Finish Line: The College Enrollment and Completion Experiences of Graduates of the Boston Public Schools*. Boston, MA: The Boston Foundation. Retrieved December 7, 2016 from http://www.tbf.org/~/media/TBFOrg/Files/Reports/GettingCloser_011513.pdf

Sum, A., I. Khatiwada, and S. Palma. 2014. *The College Persistence and Graduation Experiences of Success Boston Coaching Participants from the BPS Graduating Class of 2009*. Boston, MA: Center for Labor Market Studies, Northeastern University. Retrieved from https://repository.library.northeastern.edu/downloads/neu:m0407544b?datastream_id=content

Swecker, H. K., M. Fifolt, and L. Searby. 2013. "Academic Advising and First-Generation College Students: A Quantitative Study on Student Retention." *NACADA Journal*, 33 (1): 46–53.

Tan, Z. 2006. "A Distributional Approach for Causal Inference Using Propensity Scores." *Journal of American Statistical Association*, 101: 1619–37.

Torpey, E. and A. Watson. 2014. Education Level and Jobs: Opportunities by State. Washington, DC: Bureau of Labor Statistics. Retrieved February 13, 2017 from https://www.bls.gov/careeroutlook/2014/article/education-level-and-jobs.htm#learn-more

Tym, C., R. McMillion, S. Barone, and J. Webster. 2004. *First-Generation College Students: A Literature Review*. Round Rock, TX: Research and Analytic Services, TG. Retrieved December 7, 2016 from http://www.tgslc.org/pdf/first_generation.pdf

U.S. Census Bureau. 2014. *American Community Surveys, 2009-2014, 5-Year File, in 2014 Dollars*. Washington DC: U.S. Census Bureau.

U.S. Department of Education, National Center for Education Statistics. 2016. The Condition of Education 2016, Immediate College Enrollment Rate. NCES Report 2016-144. Retrieved from http://nces.ed.gov/programs/coe/indicator_cpa.asp

Visher, M., K. F. Butcher, and O. S. Cerna. 2010. *Guiding Math Students to Campus Services: An Impact Evaluation of the Beacon Program at South Texas College.* New York, NY: MDRC.

Walton, G. M., and G. L. Cohen. 2011. "A Brief Social-Belonging Intervention Improves Academic and Health Outcomes of Minority Students." *Science*, 331 (6023): 1447–1451.

What Works Clearinghouse (WWC). (n.d.). *Review protocol for individual studies in the postsecondary education topic area, Version 3.0*. Retrieved from http://www.ies.ed.gov/ncee/wwc/pdf/reference_resources/wwc_pe_protocol_v3.0.pdf


Success Boston
COLLEGE COMPLETION INITIATIVE