Summer Nudging:
Can Personalized Text Messages and Peer Mentor Outreach Increase College Going Among Low-Income High School Graduates?

Benjamin L. Castleman
Harvard University

Lindsay C. Page
Center for Education Policy Research, Harvard University

April 2013

ABSTRACT

Despite decades of policy intervention to increase college entry among low-income students, substantial disparities in college participation by family income persist. Policymakers have largely overlooked the summer after high school as an important time period in students' transition to college, yet recent research documents summer attrition rates ranging from 10 – 40 percent among students who had been accepted to college and declared an intention to enroll in college as of high school graduation. Encouragingly, several experimental interventions demonstrate that students' postsecondary plans are quite responsive to additional outreach during the summer months. Questions nonetheless remain about how to maximize the impact and cost-effectiveness of summer support. Text messaging and peer mentor outreach programs are two promising approaches both to inform students of college-related summer tasks and to connect them to professional support when they need help. In this paper, we report on two large-scale randomized trials we designed and implemented to investigate the role of technology and peer mentor outreach in mitigating summer attrition and helping students enroll and succeed in college. We find that an automated and personalized text messaging campaign to remind students of required college tasks substantially increased college enrollment in several of our intervention sites, with effects concentrated among students who resided in communities with low levels of educational attainment and few college-going supports; students who qualified for free- or reduced-price lunch; and students whose college plans were less defined as of the end of high school. We find that a peer mentor intervention increased four-year college enrollment, with effects largest for males and students with less-defined college plans. At a cost of $7 per participant for the text message campaign and $80 per participant for the peer mentor campaign, both strategies—and particularly the text outreach—are cost-effective approaches to increase college entry among populations traditionally underrepresented in higher education.

Acknowledgements: We are grateful for the collaboration and support of many people whose contributions made these interventions possible. We thank Bridget Terry Long, Laura Owen, and Eric Bettinger for their partnership implementing a broader set of summer 2012 interventions of which the text and peer mentor interventions were a part. We are very appreciative for the contributions and assistance of our intervention site partners: Sylvia Lopez, Shane Hall, Dorothea Weir, and the school counselors who staffed the intervention in the Dallas Independent School District; Alexandra Chewning, Erin Cox, Bob Giannino-Racine, and the advisors and peer mentors who staffed the intervention in the uAspire intervention sites; and Laura Keane and the advisors and peer mentors who staffed the intervention in the Mastery Charter Schools intervention sites. We thank Chris Avery, Larry Katz, Tom Kane, Jess Howell, and seminar participants at Harvard, the University of Virginia, and the SREE spring 2013 conference for their comments and suggestions on earlier versions of this paper. This project would not have been possible without research and administrative assistance from Cindy Floyd, Zack Mabel, Adam Ganik, Anna Hagen, Johnathon Davis, and Daniel Grafstein. We are also grateful to Michael Lin and the Reify Health team for developing the text messaging platform, and to the Strategic Data Project at Harvard, and in particular Sarah Glover, Jon Fullerton and Ashley Snowdon, for support throughout the project. Finally, we are grateful for generous financial support from the Bill and Melinda Gates Foundation, W.T. Grant Foundation, Lindback Foundation, Heckscher Foundation, and National Association of Student Financial Aid Administrators, all of which made these projects possible. All opinions expressed in this paper and any errors or omissions are our own.

I. INTRODUCTION

Despite several decades of policy intervention to increase college enrollment among low-income students, substantial inequality by income remains: 29 percent of youth from the lowest income quartile enter college by the age of 25, compared with 80 percent of youth from the top income quartile (Bailey & Dynarski, 2012). To date, policymakers have largely overlooked the summer after high school as an important time period in students' transition to college. However, successful matriculation is contingent on students completing a number of tasks during the summer. Several of these tasks relate to students' ability to finance their education, such as securing supplemental loans and setting up tuition payment plans; others relate to students' ability to digest and respond to a considerable volume of college correspondence, such as academic placement test registration and on-campus housing forms. Many of these tasks may be particularly challenging for low-income students who no longer have access to high school guidance counselors, may not be familiar with support resources available at their intended college, and whose families may lack college experience. As a result, students who have already surmounted many obstacles to college enrollment and who would potentially earn high returns to postsecondary education may nonetheless fail to matriculate.

Several studies document surprisingly high summer attrition rates, up to 40 percent, among students who had been accepted to and intended to enroll in college as of high school graduation (Castleman & Page, forthcoming; Daugherty, 2011; Matthews, Schooley, & Vosler, 2011). Summer attrition is particularly pronounced among low-income students and could explain a substantial portion of the gap in college enrollment by socioeconomic status. Encouragingly, recent experimental evidence indicates that students' postsecondary plans are responsive to additional outreach during the summer. In randomized trials conducted in Providence, RI (Summer 2008) and Boston, MA and Fulton County, GA (Summer 2011), high school counselors or community-based financial aid advisors helped students complete required summer tasks, at a cost of $100 to $200 per student. Students to whom counselors offered additional support were 5 to 30 percent more likely to enroll in college, depending on the site and student sub-group (Castleman, Arnold, & Wartman, 2012; Castleman, Page, & Schooley, 2012).

The results of these studies suggest that additional counselor outreach and support during the summer months can increase college enrollment among low-income high school graduates. Building from this foundation, questions remain about how to reduce costs associated with conducting student outreach; how to increase student take-up of the offer of additional assistance; and how to most effectively provide students with high-quality and personalized information about college-specific tasks and requirements, since high school counselors often lack knowledge about financial aid and matriculation requirements.

During the summer of 2012, we collaborated with several education agencies and a team of researchers to design, implement and experimentally evaluate two separate interventions to investigate

these issues.[1] The first intervention, implemented in four urban school districts, was a text messaging campaign in which we sent recent high school graduates and their parents a set of 8-10 text message reminders of key tasks to complete over the summer. The reminders were customized to inform recipients about the tasks necessary to be completed at the institution where each student intended to enroll and provided the option of requesting follow-up assistance from a counselor by responding to the message. The second intervention was a peer mentor intervention, in which we partnered with both a network of charter schools and a non-profit organization focused on college affordability to hire and train college students to reach out to college-intending high school graduates and support them in their transition to college. The peer mentors provided encouragement and first-hand perspective on the college experience, helped assess students' readiness to matriculate in college, and connected students to professional counseling, when needed.

To preview our results, we find that in several of our intervention sites, the text message intervention had a positive impact on whether students enrolled in college. College enrollment rates were 4 – 7 percentage points higher among students who received the text messages in these groups relative to their counterparts who did not receive messages. The effects were concentrated among students who resided in communities with low levels of educational attainment and few college-going supports; students who qualified for free- or reduced-price lunch, and students whose college plans were less defined as of the end of high school. We do not find impacts of the text intervention in the intervention site that had highest levels of educational attainment in the community and a high concentration of college-going supports for students. The peer mentor intervention increased four-year college enrollment by 4.5 percentage points, with effects largest for males and students with less-defined college plans.

We organize the remainder of the paper as follows. In Section II, we review the literature relevant to interventions aimed at improving college access and success. In Section III, we describe our research design, including the sites, data and sample for each intervention; the design of each intervention; and the process of and timeline for randomization. In Section IV, we present our results. In Section V, we conclude with a discussion of these findings and their implications for policy, practice, and further research.

II. LITERATURE REVIEW

Despite a variety of efforts to improve college access among low-income youth, policymakers have not focused particularly on the period between high school graduation and college matriculation. The college access literature, similarly, has not emphasized the summer. Among college preparatory initiatives, there is frequently a push to "start early," by reaching out to students in the elementary and

[1] These interventions were part of a larger set of summer 2012 interventions to which we referred as Project SCOPE: Summer Counseling Outreach for Improving Postsecondary Enrollment

middle grades. Nevertheless, there is not a corresponding emphasis on "staying late," by continuing to work with college-admitted students after they graduate high school but before they matriculate to college (Arnold et al, 2009). And while college admissions officers have been aware of summer melt for at least a decade (see *How to Talk Like an Admissions Dean,* 2001), the prevailing assumption has been that for seniors who follow the standard path through college application, selection, and deposit, the summer melt rate is quite low and, moreover, that students who melt from a particular college instead enroll at a peer institution.

However, college-intending, low-income high school graduates are quite susceptible to having their college plans change during the summer months following graduation. Using data from the Education Longitudinal Study of 2002 and from administrative data in Boston, Castleman and Page (forthcoming) estimate summer attrition rates between 10 and 20 percent among college-intending students. These findings are consistent with similar evidence from the Chicago Public Schools (Roderick et al, 2008) and with qualitative data indicating that low-income students struggle especially with evaluating financial aid offers and completing the necessary steps to enroll even after paying a spring deposit to a particular college (Arnold et al, 2009). Additional research finds even higher levels of attrition among college-intending graduates in large urban districts such as the Fulton County Schools (Fulton County, GA) (Matthews, Schooley & Vosler, 2011) and the Fort Worth Independent School District (Fort Worth, TX) (Daugherty, 2011).

Why do college-intending students melt?[2] Students may decide not to matriculate because they acquire new information during the summer which changes their assessment of the benefits or costs of college (Becker, 1964; Castleman, Page, & Schooley, 2012). Alternatively, students may recognize the long-term benefits of a college degree but be unwilling to incur the near-term costs remaining on their tuition bill. Recent behavioral economic research suggests that individuals often overweight immediate costs and forego investments that would be in their long-term interest (e.g., Chabris, Laibson & Schuldt, 2008). Students may also hesitate to give up the predictability of their current situation for the uncertainties of college, even if in the long term they would likely benefit from higher education (Kahneman & Tversky, 1979).

Additionally, students may fail to realize their college intentions because they lack sufficient information about college costs and options for education financing and are therefore unprepared to pay the tuition bill they receive mid-summer (Arnold et al., in progress; Avery & Kane, 2004; Horn, Chapman, & Chen, 2003; Grodsky & Jones, 2007). Relatedly, even among students who are able to access college information over the summer, the complexity of required paperwork and other tasks may impede students' ability to complete all of the steps necessary for successful matriculation (Avery & Kane, 2004; Bettinger

[2] For a more comprehensive discussion of why college-intending high school graduates may choose not to enroll during the fall semester following high school, see Castleman (2013),

et al, 2012; Dynarski & Scott-Clayton, 2006). In the context of the summer after high school, for example, students may struggle to distinguish grant aid from loans on financial aid award letters. Completing these intricate processes requires substantial cognitive effort and is likely to be challenging for adolescents, particularly students from disadvantaged backgrounds who have to devote their time and energy to addressing immediate stressors like supporting their families financially or dealing with neighborhood violence (Casey, Jones, & Somerville, 2011; Keating, 2004; Mullainathan, 2011; Steinberg, 2008, 2009). Faced with the time and cognitive burdens associated with completing required college tasks over the summer, students may instead opt to put off, or abandon entirely, the tasks required for matriculation—particularly if the alternative is something more enticing in the present moment (Madrian & Shea, 2000; Beshears et al, 2012; Scott-Clayton, 2011).

Correspondingly, students may melt because they miss key deadlines or run out of time to complete all that is required of them. Karlan et al. (2010) posit that regular reminders should mitigate this "attentional failure" and help individuals smooth resource allocation in preparation for a future expenditure, such as contributing to a financial savings account or investing in higher education. Such prompts may be particularly important during the summer after high school, during which students may not receive any personalized outreach reminding them of required tasks (Arnold et al, 2009). In the absence of these "nudges," students may easily get off track in completing critical college-related tasks in the summer prior to matriculation (Thaler & Sunstein, 2008).

Thus, there are a variety of mechanisms through which the combination of improved information and the offer of summer assistance could increase the probability that students matriculate in college. Information and counseling may increase students' willingness to make short-term investments in expectation of longer-term benefits associated with higher education. With improved information and counseling, students may also overcome the complexities in the required paperwork they receive from their intended college. Finally, with regular reminders, students may be better able to devote time to task completion incrementally throughout the summer, and therefore increase their probability of enrollment.

As several recent randomized trials indicate, offering students additional counseling during the summer can have a substantial impact on whether they enroll in college. In a pilot experiment, Castleman, Arnold and Wartman (2012) assigned proactive college counseling to a randomly selected group of recent graduates from seven small, urban high schools in Providence, RI. School-based counselors worked with students throughout the summer to secure additional financial aid, complete paperwork, and alleviate concerns about college. Treatment group students were 14 percentage points more likely to enroll in college in the fall semester. The intervention cost less than $200 per student, suggesting that summer support may be a low-cost means of promoting college enrollment among low-income students.

Building on this pilot, Castleman, Page and Schooley (2012) conducted two larger scale experiments in Boston, MA and Fulton County, GA to investigate whether summer counseling increases

college enrollment among a more mainstream population of high school graduates. Like the pilot, summer outreach and counseling cost about $100 – $200 per student. Across the sites, the offer of counseling increased the probability of fall college enrollment by nearly four percentage points; these impacts persisted into the spring semester. In Fulton County, the offer of support increased immediate enrollment by nearly eight percentage points among students who qualified for free/reduced price lunch. The most lasting impacts (to date) were in Boston, where the offer of support increased continuous enrollment into sophomore year of college by nearly nine percentage points. These results reinforce earlier experimental evidence which demonstrated that providing high school students with better information about and assistance with college and financial aid applications positively impacts postsecondary enrollment (Bettinger et al, 2012; Carrell & Sacerdote, 2012: Berman, Ortiz & Bos, 2008).

Several open questions remain about summer attrition among college-intending students, and how to most effectively provide students with support during this time period. One important question is to whose offer of help students are most likely to respond. In both the summer 2008 and summer 2011 interventions, school counselors or financial aid advisors conducted the outreach. Would students be more responsive to peers in college who graduated from the same high schools and who can share first-hand experiences of how they navigated summer obstacles and managed to succeed in college? Another key question is the relative importance of *personal* outreach (e.g. a phone call from a counselor) versus *personalized* outreach? Counselors reported investing substantial time just trying to reach students and get them in the door to meet. What if we could automate and personalize outreach, and at the same time share timely information specific to students' intended college? In summer 2012, we designed two randomized trials to investigate these questions.

The Potential of Using Technology to Reach Out to Students: Text Messaging College Information

Text messaging is a promising approach to both inform students of college-related tasks and to connect them to professional help when they need assistance. Texting is the predominant means by which young people communicate. Whereas only six percent of teens exchange emails and 39 percent of teens talk via mobile phones, 63 percent send texts on a daily basis (Lenhardt, 2012). Further, counselors from prior summer interventions cited texting as the most effective means of contacting students (Arnold et al.,, in progress). In addition, texting is a potentially cost-effective means to provide students with information and connect them to assistance. For the intervention discussed below, the marginal cost of delivering each message is $0.01. Moreover, a text message campaign may increase the efficiency of school counselors' time. With a text platform, message delivery can be *automated* and *personalized* to individual students and their postsecondary plans, eliminating counselors' substantial investment of time in initial outreach and instead allowing them to focus efforts on providing guidance where needed. Finally, research in both public health and development economics has found positive impacts from text messaging campaigns on

desired outcomes, such as whether individuals contribute regularly to a savings account or get a flu vaccination (Karlan et al, 2010; Stockwell et al., 2012).

There are several mechanisms through which personalized text messages could positively impact successful fall matriculation among college-intending students. As noted above, text messaging may be an efficient strategy for connecting students to school counselors who can help them address summer obstacles to enrollment. A range of factors, including adolescents' perception of their academic and social competence, their level of motivation, and their attitudes towards help-seeking, influence whether students seek out assistance with school-based problems (Boldero & Fallon, 1995; Newman, 1994; Ryan & Pintrich, 1997; Tynsley et al, 1982). Enabling students to request assistance via text message minimizes a number of potential barriers to help-seeking. For instance, in under-resourced schools where counselors have large caseloads and minimal time to focus on college planning, high school graduates may have had limited personal relationships with counselors (Civic Enterprises, 2012). This lack of personal connection may inhibit students from initiating contact with a counselor. Taking up the offer of individualized help by responding to a text message, on the other hand, may require considerably less interpersonal effort. A related point is that students may feel less threatened by asking for help via text messaging than they would over the phone or in person.

Personalized text messages may also impact successful college matriculation by informing students of required summer tasks about which they were previously unaware, and/or by simplifying the steps required to complete these tasks. Particularly as colleges have moved towards online dissemination of information, students may struggle to comprehensively identify the set of tasks and associated deadlines required to successfully matriculate. While many colleges now have "Admitted Students" websites that identify required summer tasks, students often have to navigate a complex set of peripheral web pages to find task-specific resources and due dates.[3] By contrast, with a small upfront investment to assemble a list of required tasks and deadlines for the institutions most frequently attended by partner districts' graduates, our research team consolidated the set of required tasks into a series of 8-10 text message reminders customized to students' intended college. These messages can furthermore include institution- and task-specific web links that guide students directly to the web page relevant to completing a given task (e.g. registering for orientation).

Finally, the text messages may positively impact students' college outcomes simply by nudging them to complete required task at the relevant time during the summer. Personalized messaging

[3] For instance, the Admitted Students page may indicate that students are required to complete academic placement tests prior to registering for orientation. However, students may then need to navigate to a different web page to find relevant specifics such as when and where to take the tests and whether they are exempt based on their college entrance exam scores. Details, such as formatting, may vary across these web pages, adding to the time and cognitive effort required to distill key tasks and deadlines As a point of reference, it typically took our Harvard College undergraduate research assistants 1 – 1.5 hours per college to assemble all of the institution-specific required summer tasks, deadlines, and web links.

effectively may turn adolescents' greatest liability during the college choice process—their impulsiveness—into an asset.[4] By providing simplified information and college- or task-specific links, each message allows completion of required steps in the moment, before students' attention is diverted to another activity.

The Potential of Peer Mentoring to Mitigate Summer Attrition

Peer mentoring also offers promise as a strategy to increase college going among low-income high school graduates. Mentoring can yield positive effects on academic achievement, self-worth, and improved familial relationships at various stages in children's development (Grossman & Tierney, 1998; Rhodes, Grossman, & Resch, 2000; Thompson & Kelly-Vance, 2001). Programs that pair students with near-age peers have had positive impacts on students' sense of connection to school, social skill development, and academic achievement (Karcher, 2005, 2006; Stoltz, 2005). Specific to college access, mentoring can enhance interest in college among first-generation students and increase students' access to information about college and financial aid processes (DuBois et al, 2002; Gandara & Mejorado, 2005).

For several reasons, peer mentoring may be a particularly effective strategy for positively impacting students' college-going outcomes. Steinberg (2005) documents a century-long process of adolescents becoming increasingly separated from adult life. Adolescents now spend considerably more time with their peers than with adults, and particularly with the onset of mobile and social media technologies, they interact much more frequently with peers than they do with adults (Lenhardt, 2012; Subrahmanyam & Greenfield, 2008). As a result, high school graduates may be more likely to respond to summary outreach from peers than from adults who make similar efforts. Peer mentors are also more likely to be facile with modes of communication that are heavily utilized by recent high school graduates.

Peer mentors may be uniquely effective at positively altering students' perceptions of social norms regarding postsecondary choices. Students from underrepresented groups may lack a sense of belonging at colleges and universities if they perceive these institutions to be the domain of affluent, White students (Walton & Cohen, 2007). They may also fear that they would need to downplay their group identity in order to succeed in college (Cohen & Garcia, 2005). Students' uncertainty about whether they would fit in on campus may result in greater stress (Lovelace & Rosen, 1996), an additional impediment to completing required summer tasks.

Further, the behavior of peers in a social environment influences how individuals of all ages respond to a given situation (Cialdini & Goldstein, 2004). In uncertain situations, individuals may be particularly influenced by peer behavior if they believe that following the actions of others will lead to better outcomes (Cialdini, 2001). Individuals may also be more influenced by the actions of peers whom they perceive to share characteristics, such age and gender (Murray et al, 1984; White, Hogg & Terry,

[4] We are grateful to Tom Kane for making this point.

2002). Therefore, near-age peer mentors who are from similar backgrounds, who graduated from high schools in the same city, and who are currently thriving in college may therefore shift recent high school graduates' views about who goes to and succeeds in college. To the extent that this change in perspective reduces the psychic costs associated with college, students may be more likely to complete required summer tasks, and/or seek out individualized assistance if they need help in order to matriculate.

Peer mentors may also increase the probability that students matriculate by concretizing the potential benefits of going to college. Time and travel costs may prevent students from visiting their intended college campus, and first-generation college students who received little college counseling in high school may have difficulty visualizing college life. As a result, students may have far less access to information about the benefits of college than traditional human capital investment models would posit. Students may accordingly be averse to forego current situations in favor of an unfamiliar environment (Tversky & Kahneman, 1979). Therefore, peer mentors may be helpful in solidifying students' perceptions of what college has to offer. Especially when peer mentors are from similar age, racial/ethnic, and gender groups, students may find their perspective and experience particularly salient.

Research Questions

We evaluate the impact of a text messaging campaign and a peer mentor outreach intervention on whether college-intending high school graduates successfully matriculate in college. Our analyses are organized around the following research questions:

1. Does an automated and personalized summer text messaging campaign, which informs students of college tasks to complete and that offers to connect them to professional college-going assistance, increase the probability that students enroll and attend college during the fall semester immediately after high school graduation relative to students who do not receive any outreach?
2. Do students who receive proactive and repeated outreach from a peer mentor during the summer enroll in college at a higher rate than students who do not receive any outreach?
3. Do personalized text messages with the offer of counselor assistance and peer mentor outreach impact rates of college enrollment similarly, or is one approach more effective than the other?

III. RESEARCH DESIGN

Sites

During the summer of 2012, we collaborated with three educational agencies, the Dallas Independent School District (Dallas ISD); uAspire, a Boston-based non-profit organization focused on college affordability; and Mastery Charter Schools, a network of charter schools in the Philadelphia metropolitan area (Mastery) to conduct the text message and peer mentor interventions. We implemented the text message intervention with both Dallas and uAspire and the peer mentor intervention with uAspire and Mastery. Dallas ISD is a large, urban school district, serving approximately 158,000 students across

227 high schools. There are 22 traditional high schools and 10 magnet high schools in the district. Approximately 7,000 seniors graduate from the district each year.[5] uAspire operates several programs in partnership with three Massachusetts school districts: the Boston Public Schools, the Lawrence Public Schools, and the Springfield Public Schools. The program most relevant to the text messaging and peer mentor interventions is the High School Advising Program, which places financial aid advisors in every public high school in each of the three districts. uAspire advisors spend at least one day per week hosting group workshops and working individually with students in their assigned school(s) for the entire school year. Mastery Charter Schools serve approximately 8,000 students in grades kindergarten through 12. The first Mastery Charter School was founded in 2001 by a coalition of Philadelphia business and civic leaders. The network has since grown to 11 schools.[6]

In Table 1, we provide descriptive information on educational attainment and socioeconomic status in Dallas, the three Massachusetts sites with whom uAspire works, and Philadelphia to illustrate important differences among these communities. For educational attainment, we report, by district, the 2011 four-year high school graduation rate for students who entered ninth grade in Fall 2007 and the percent of adults in each community with a bachelor's degree.[7] For socioeconomic status, we report the unemployment rate and the percent of persons living below the poverty level in each city.[8] We present the unemployment rate in each city for May 2012, or just before the start of the text message and peer mentor interventions.

Educational attainment varies considerably across communities, with substantially lower rates of educational attainment in Lawrence and Springfield relative to Dallas, Boston and, to a lesser extent, Philadelphia. Among students entering ninth grade in Fall 2007, 77.3 percent graduated high school within four years in Dallas, compared with 64.4 percent in Boston, 61 percent in Philadelphia, and just over half of students in Lawrence and Springfield (52.3 percent and 52.1 percent, respectively). And whereas 42.5 percent of adults in Boston, 28.6 percent of adults in Dallas, and 22.6 percent of adults in Philadelphia held bachelor's degrees, only 11.6 percent of adults in Lawrence and 16.9 percent of adults in Springfield did so. According to a needs analysis conducted by uAspire prior to its expansion into Lawrence and Springfield, students in these communities also received considerably less college-going support, either within their high schools or within the broader community, than did students in Boston.[9]

---

[5] For more information on the Dallas Independent School District, visit: http://www.dallasisd.org

[6] For more information on Mastery Charter Schools, visit www.masterycharter.org.

[7] We obtained the degree attainment data from the US Census Bureau; each statistic corresponds to a five-year average, from 2006-2010, for each city. Results for Philadelphia correspond to 2007-2011.

[8] The unemployment data for each city comes respectively from the Texas Workforce Commission, the Massachusetts Executive Office of Labor and Workforce Development and the US Bureau of Labor Statistics, while the poverty level data also comes from the US Census Bureau, and reports a five-year average (2006-2010) for each city. Poverty level data for Philadelphia corresponds to years 2007-2011.

[9] Details of this needs assessment are available upon request from uAspire.

Socioeconomic status also differed by city, with higher rates of poverty and unemployment in Philadelphia, Lawrence and Springfield. Just over 21 percent of people in Boston and 22.3 percent of people in Dallas lived below the poverty line, compared with 25.6 percent of people in Philadelphia, 26.5 percent of people in Lawrence and 27.6 percent of people in Springfield. And while the May 2012 unemployment rate in Boston and Dallas was under seven percent (5.7 percent in Boston and 6.9 percent in Dallas), the unemployment rate was 9.4 percent, 10.2 percent, and 13.1 percent in Springfield, Philadelphia and Lawrence, respectively.

These community-level differences have important implications for the potential impact of the text message and peer mentor interventions. For instance, students in Lawrence and Springfield may have been particularly responsive to the offer of personalized information or personal outreach from a near-age peer, given that they were less likely to have an adult in their life who had completed college, received less support with the college and financial aid processes while in high school, and potentially had more limited unemployment opportunities than their counterparts in Boston or Dallas.

Data and Sample

We capitalize on several data sources in our analyses. First, each site provided student-level demographic and prior academic achievement information. These data include students' gender, race/ethnicity, free/reduced price lunch status, FAFSA completion status, high school GPA, and scaled score on state achievement tests. The data do not align perfectly across sites. While we have a common set of demographic information across all sites, and student-level measures of senior year GPA and math and ELA state assessment score in Dallas and Philadelphia, we only have students' self-reported high school GPA for the uAspire sites. And while we have records of students' college intentions for the uAspire sites, we do not currently have this information for Dallas ISD.[10] The sites also provided interaction-level records from the peer mentor and counselor interaction logs. These logs include information on whether students took up the offer of help from a peer mentor or counselor; when and where the interaction took place, and what help the mentor or counselor provided.

Second, each site obtained student-level college enrollment records from the National Student Clearinghouse, a non-profit organization that maintains college enrollment records at approximately 95 percent of colleges and universities in the country.[11] Finally, among students assigned to text messaging,

[10] Students did provide information on their college intentions on the Dallas ISD exit survey. The exit survey was done on paper, however, and Dallas ISD was only willing to have counselors record this information in a spreadsheet for students assigned to the text message intervention. Counselors then transferred this information directly to the text message provider, Reify Health. Dallas ISD was unwilling to send the surveys for students in the control group outside of the district to be entered into a spreadsheet. We are currently working with both the district and Reify to investigate whether Reify can send the college intentions information for treatment group students back to the district, where the student-identifying information can be stripped prior to the district then transferring to our research team the college intention information.

[11] An important point about the NSC data is that coverage rates vary considerably by state (Dynarski, Hemelt, & Hyman, 2012). For instance, in West Virginia the NSC only covers 68 percent of higher education institutions.

Reify Health, the text messaging platform our research team contracted with to deliver the text messages, provided data on whether recipients responded to a text message, the date of their response, whether they requested help from a counselor, and whether they requested that we stop sending future messages.[12]

The overall experimental sample included students our research team identified as college-intending as of high school graduation. Our definition of college-intending varied across sites. Dallas ISD participates in the United States Department of Education FAFSA Completion Pilot, which provides partnering districts with student-level data on whether high school seniors have started or completed the FAFSA.[13] We proxied for students' college intentions based on whether they had completed (or at least started) the FAFSA as of high school graduation. 2,920 of 8,066 seniors in Dallas ISD met this sample criterion. In the uAspire sites, we proxied for college intentions based on whether students had initiated at least two individual meetings with a uAspire advisor during the school year. uAspire leadership identified this benchmark as a relevant demarcation between students with moderate to strong college intentions and students whose postsecondary plans were more uncertain. 2,833 out of 4,042 students who received individualized assistance from a uAspire financial aid advisor during senior year met this sample definition. For Mastery, we capitalized on data gathered from a high school exit survey in order to identify college-intending students. Of 568 high school seniors 443 reported specific postsecondary intentions on the exit survey and were therefore included in the Mastery sample.

In Tables 2 and 3, we provide descriptive statistics by intervention site, for both the overall sample within each site and for our analytic sample of college-intending students. In Table 2, we present demographic characteristics and in Table 3, we present academic achievement and postsecondary intention information. Across sites, the sample included primarily students of color and students who qualified for free or reduced price lunch (FRL). In Dallas, by the end of senior year, just over a third of seniors (36 percent) had completed the FAFSA. The subset of Dallas ISD seniors who completed the FAFSA were more likely to be female, more likely to be Black, and had math and ELA state assessment scores that were approximately three-tenths a standard deviation higher than for the entire senior class.

In the uAspire sites, 65 - 75 percent of all students who met with a uAspire advisor during the year completed the FAFSA by the end of high school, with substantially higher FAFSA completion rates among students in our analytic sample who met at least twice with a uAspire advisor. The uAspire sites differ notably by students' college intentions. For example, while only a quarter of Boston students intended to enroll at a two-year institution, 64 percent of Lawrence students and 58 percent of Springfield

---

Fortunately, the coverage rates are fairly high in Massachusetts (94 percent), Pennsylvania (90 percent), and Texas (90 percent), where the majority of students in our experimental sample attend college.

[12] Reify first transferred this data to each site, where analysts removed student-identifying data before transferring the text message response data to our research team.

[13] For more information on the FAFSA Completion pilot: http://studentaid.ed.gov/data-center

students had such intentions. These patterns are similar for the overall sample of uAspire students and for our analytic sample of students who met at least twice with a uAspire advisor during the year.

In the Mastery high schools, 95 percent of students with college intentions had completed the FAFSA by the time of high school graduation. Mastery seniors graduated with an average GPA of 2.56. GPA was somewhat higher among college-intending graduates, although standardized test performance differed by only one-twentieth of a standard deviation between the two groups.

Intervention design

In this section we provide an overview of the intervention design for both the text messaging and peer mentor interventions. We provide additional details of each intervention design in Appendix A.

Intervention #1: Text Messaging to Inform Students and Connect Them to Assistance

The core of the text messaging campaign was a series of 8-10 text messages that reminded students and their parents of tasks they needed to complete at their intended college and offered to connect recipients to a school counselor from their district if they needed additional individualized assistance.[14] More specifically, the messages reminded students to: log on to their intended college's web portal (e.g. wolverineaccess.umich.edu) to access important paperwork; register for orientation and placement tests; complete housing forms; and sign up for or waive health insurance, if relevant. The messages also offered students help completing the FAFSA, if they had not done so already, and interpreting the financial aid award letter and tuition bill they received from their intended college. Most of the messages included web links that allowed students to complete tasks directly from phone (if they had a smart phone and data plan).[15] For instance, for students planning to enroll at the University of Massachusetts-Boston, the message regarding required summer orientation included a web link for the University of Massachusetts-Boston orientation registration web site. The text messages were delivered between early July and mid-August, with messages delivered in approximately five-day intervals. In Figure 1, we provide a comprehensive timeline for both the text message and peer mentor intervention. We worked with our intervention site partners to collect the student- and college-level information necessary to personalize the text messages, and contracted with Reify Health, a start-up company aimed at improving health and education outcomes through the application of mobile technologies, to deliver the messages. For additional details on the information we relied on for the text messaging campaign, see Appendix A.

For students or parents who responded to the text outreach to request help, we generated an email message to a counselor from the student's education agency, informing the counselor that the recipient had requested help. These "help request" emails provided counselors with the student's or parent's name and cell phone number so the counselor could contact the student directly. For students or parents who

[14] Students who were planning to attend a less common institution received a generic set of reminders.
[15] The actual message content is available upon request.

requested to stop receiving messages, we were able to cancel all future message delivery. Finally, for recipients who were skeptical about the messages and wanted further information about the sender, we were able to generate a standard response confirming the message was from Dallas ISD or uAspire and encouraging recipients to contact the district/uAspire with any questions.

The final component of the intervention was the individualized support that counselors provided to recipients when they requested assistance. We developed a number of tools to help guide counselors' interactions with students and parents, including comprehensive checklists of what to cover in follow-up meetings. Counselors documented their interactions with students from both the treatment and control groups in an online interaction log in which counselors reported when and where they interacted with each student and what help, if any, they provided to the student during the interaction. In Table A1, we provide details of the number of counselors; the hours worked per counselor, and the student caseload per counselor, for each site that participated in the text message intervention.

Intervention #2: Personal outreach from peer mentors currently enrolled in college

The peer mentor intervention largely built on the previous summer college counseling interventions described above, in which counselors proactively reached out to students to offer them help addressing potential barriers to college enrollment. The primary difference with the peer mentor intervention was that college students who had graduated from public high schools in each uAspire site or from a Mastery high school were conducting the initial outreach to students and providing the first level of support and guidance.

uAspire and Mastery were responsible for peer mentor selection and training. They selected peer mentors based on several primary criteria: students had to have worked with uAspire during high school or have graduated from a Mastery high school; be enrolled in college and in good academic standing; and have received financial aid and have a clear understanding of the financial aid process. Peer mentors were employed from mid-June, 2012 – mid-August, 2012, and worked approximately 20 hours per week. In Table 4, we provide summary information for the 20 peer mentors who staffed the intervention. Nine were based in Boston, two in Lawrence, three in Springfield and six in Philadelphia. Within each site, there was a roughly equal balance between men and women among the peer mentors, with the exception of Mastery, where all but one of the mentors was female. In the uAspire sites, all but one of the peer mentors attended a four-year college or university, with a roughly equal divide between private and public institutions, and all but one of the peer mentors was either a junior or senior. The peer mentors graduated from a range of high schools, including comprehensive high schools, pilot schools, vocational/technical schools, and exam schools. uAspire and Mastery provided several days of training for the peer mentors, as well as ongoing support for peer mentors throughout the summer. For additional information on the training content, see Appendix A.

Peer mentors had several goals in their initial outreach to students. Their primary task was to make contact with students and assess their readiness for fall college matriculation. We developed an intake form to guide peer mentors in their outreach to students. Some of the core topics that peer mentors covered in their initial conversation were whether the student: (1) was still planning to enroll in college, and if so, at the college they indicated at the end of senior year; (2) had completed the FAFSA; (3) had received and reviewed a financial aid award letter; and (4) had registered for orientation and placement tests. Following this initial assessment, peer mentors scheduled in-person meetings or follow-up phone conversations to help students address issues that arose during the initial conversations. For instance, peer mentors helped students interpret their financial aid award letters and explore tuition payment plan options if they faced a gap between their award letter and tuition bill. Peer mentors also reviewed the briefing documents for the colleges and universities frequently attended by graduates at participating sites and helped students identify tasks they had yet to complete.

Peer mentors did not, however, work on any tasks that required students to provide financial information about themselves or their families, such as completing the FAFSA or applying for supplementary loans. For these tasks, and any other areas in which the peer mentor felt they needed additional guidance to comprehensively support the student, peer mentors referred students to meet with a supervising counselor. For information on the advisor staffing structure to support the peer mentor intervention, see Appendix A.

Both Interventions

Randomization and caseload assignments

In Table 4, we present the number of students assigned to each experimental group, by site. In Dallas ISD the head of counseling first assigned each of the nine participating counselors to a set of high schools within the district. The district then identified students within the high schools covered by each counselor who had completed the FAFSA. Among FAFSA completers and within each counselor's cluster of high schools, 1,454 students were then randomly assigned to receive the text messages, and 1,466 students were assigned to the control group. Randomization was conducted in early June, with the first text messages delivered to students in early July.

The uAspire randomization was done within each site, with students assigned to one of three experimental groups. Of the 1,843 students in Boston who had met at least twice with a uAspire advisor during the academic year, 697 were assigned to the text intervention, 450 were assigned to the peer mentor intervention, and 696 were assigned to the control group. Of the 294 eligible students in Lawrence, 100 were assigned to the text intervention, 94 were assigned to the peer mentor intervention, and 100 were assigned to the control group. And of the 696 eligible students in Springfield, 273 were assigned to the text intervention, 150 were assigned to the peer mentor intervention, and 273 were assigned to the control group.

The Mastery randomization was done within each of the five participating high school campuses. At each campus, the data analyst selected a caseload of 40 students for each participating peer advisor. In the one campus staffed by two peer mentors, the analyst selected 80 students and distributed them at random to these mentors. At each campus, the remaining eligible students were assigned to the control group for a total of 240 students assigned to receive peer mentor outreach and 203 students assigned to the control group. For both uAspire and Mastery, randomization was conducted in mid-June, with peer mentor outreach beginning to students in late June and the first text messages delivered to students in early July.

In Boston, the three advisors assigned to the text messaging intervention did not have defined caseloads. Rather, recipients' meeting requests were routed via email to a summer intern, who then distributed the requests among the three advisors staffing the intervention. In Lawrence, there was only one advisor so all students in the text message treatment group were assigned to her caseload. In Springfield, text message students were assigned to the caseload of the advisor with whom they had worked during the academic year.

Among students who were randomly selected to receive outreach from peer mentors, uAspire assigned peer mentors caseloads of approximately 40 to 50 students each, with primary consideration given to matching students and peer mentors on gender where possible. Additional rules governing caseload assignments varied substantially by uAspire site; for more information on these assignment rules, see Appendix A.

In Table 5, we assess the baseline equivalence of the treatment and control groups within each site. In the Dallas ISD experimental sample, we utilized a probit model to regress the indicator for treatment on the vector of baseline covariates described in Tables 2 and 3, along with fixed effects for school counselor (column 1). In the Mastery sample, we utilize an analogous model with fixed effects at the school campus level (column 8). In the uAspire experimental sample, because students were assigned to either the text message or peer mentor intervention, we utilized a multinomial logit model to regress a polychotomous indicator for whether students were assigned to the text message group, peer mentor group, or control group on the vector of baseline covariates. We fit the multinomial logit models within each uAspire site. The base outcome value in these models was for students assigned to the control group. In the table, we report the logit coefficients for students assigned to the text message group in each site (columns 2, 4, and 6) as well as for students assigned to the peer mentor group (columns 3, 5, and 7). In the last row of the table we report the p-value on the chi-squared test for whether the covariates jointly explained variation in experimental group assignment. Across all sites, we fail to reject the null hypothesis that the covariates did not jointly explain variation in assignment, and therefore conclude that students in the treatment and control groups were equivalent at baseline.

Measures

To evaluate the impact of the interventions on students' college enrollment in the fall semester following high school graduation, we generated several binary outcome measures from the National Student Clearinghouse (NSC) data. These include whether the student enrolled in the fall semester immediately following graduation and whether the student enrolled at a four-year or two-year institution.

The primary explanatory variables in our analyses are indicators for whether the student was randomly assigned to one of the treatment groups. To increase the precision of our analyses, we include the academic, demographic and, where available, college intention covariates described in Table 2. We include indicator variables for missingness for any covariate with missing values, including missingness because the measure is only recorded for one of the intervention sites (e.g. state assessment scores are measured in Dallas but not in the uAspire sites). We also include fixed effects for the level at which randomization was conducted at each site: counselor fixed effects for Dallas, site fixed effects for uAspire, and high school campus fixed effects for Mastery.

Empirical Strategy

In order to investigate the impact of each treatment on the binary college outcomes, we utilize probit models. We present results of the interventions both for the pooled sample and separately for each site. Within the uAspire-specific analyses, we report the results of both the text message and peer interventions on students' outcomes. We specify the following Intent-to-Treat (ITT) model for our analyses:

$$(1)\ \Pr\left(COLLEGE_{ij} = 1\right) = \Phi\left(\alpha_j + \beta_1 TEXT_{ij} + \beta_2 PEER\_MENTOR_{ij} + \gamma X_{ij} + \epsilon_{ij}\right),$$

where for student i assigned to counselor or site j, $COLLEGE_{ij}$ represents a dichotomous college enrollment outcome; α_j is a fixed effect for the site-appropriate level within which randomization was conducted; and X_{ij} is a vector of student-level covariates. In this model, β_1 provides the causal effect of the text messaging intervention on students' outcomes, while β_2 provides the causal effect of the peer mentor intervention on students' outcomes. In the uAspire sites, a chi-squared test on the hypothesis that β_1 is equal to β_2 indicates whether there was a differential impact of the text message vs. peer mentor interventions on students' college entry.

We also examine, in both the pooled sample and within individual sites, whether there were heterogeneous effects of either treatment. We focus in particular on whether the treatments had larger effects on students with less access to college and financial aid information, and on students with less defined college plans as of high school graduation. Our rationale is that these sub-groups would be most impacted by personalized reminders of important college tasks to complete and by the offer of individualized assistance from a peer mentor or school counselor. We proxy for access to college information in several ways. First, we examine whether the intervention had differential impacts by site, given the disparities in educational attainment across communities. We also investigate whether the

treatment had a larger impact for students who qualified for FRL, since these students were arguably more likely to be the first in their family to go to college, and by students' senior year GPA, since students with lower GPAs may have been less likely to benefit from individualized college assistance during high school. We examine whether the impact of the text intervention varied by whether students had a specific college they planned to attend as of high school graduation or not, on the theory that students who were still undecided about which college to attend were less likely to have received information about required tasks to complete over the summer.[16] These students could therefore be particularly responsive to outreach and support, although because they had not chosen a college to attend, the text reminders would be generic, rather than institution-specific. Finally, we examine whether the intervention had a greater impact for students who had met fewer times during the academic year with a uAspire advisor, on the theory that students who met frequently with a uAspire advisor were more likely to have received considerable guidance on their financial aid award letter and required summer tasks they would need to complete. The average number of meetings with a uAspire advisor was approximately four, so we examine whether either intervention had a differential impact for students who had fewer than four meetings vs. four or more meetings during the academic year.

In addition to impact analyses, we conducted several descriptive analyses to explore channels through which each intervention may have impacted students' outcomes. To assess whether the texting intervention increased recipients' knowledge about key summer tasks, we used implementation data corresponding to each message to estimate the number of recipients that followed the embedded institution-specific web links. We capitalized on the fact that uAspire students were randomly assigned to either receive text messages or peer mentor outreach to investigate whether there were differences in the proportion of students in each group that met with a uAspire advisor over the course of the summer. In the case of the peer mentor intervention, we also examined the proportion of students' interactions that were with peer mentors vs. uAspire advisors, and whether students were more or less likely to interact with a peer mentor who attended the same high school or college as the student.

IV. RESULTS

Intervention implementation

We begin our analyses of the impact of the text messaging and peer mentor interventions by examining the efficacy of text message delivery as well as the extent of student responsiveness to the messaging campaign and peer mentor outreach.

[16] In Lawrence and Springfield, advisors were able to contact almost all students, or in Springfield rely on district data on students' college intentions as of high school graduation, so the college intentions information in these sites is quite complete. In Boston, there was a greater number of students who uAspire advisors were not able to contact at the end of senior year, so for these students, it is harder to disentangle whether the students' were undecided about their college intentions, or if they had just not communicated their plans to uAspire.

One challenge in implementing a text messaging intervention is simply getting the phone numbers to which messages can be sent. In Table 6, we present descriptive data on the text message delivery rates by education agency.[17] These data were provided directly by Reify Health. In Dallas, out of 1,454 students assigned to the text messaging intervention (row 1), only 848 students provided a phone number on the high school exit survey (row 2). Of these 848, Reify verified that the considerable majority, 814, were working cell phone numbers (row 3).[18] Thus, between students who did not provide a cell number and a small share of provided numbers that were not valid cell numbers, we were only able to send messages to 56 percent of Dallas ISD students assigned to the text intervention (row 4). The uAspire rates are somewhat higher: out of 1,070 students assigned to the text messaging intervention, 806 students provided their phone number, and of these, 768 were working cell phone numbers. We were therefore able to send messages to 72 percent of uAspire students assigned to the text intervention.

In the lower panel, we present analogous figures for the parental cell phone numbers. Over half (781) of Dallas ISD students provided a parent cell phone number on the high school exit survey; of these, Reify was able to send messages to 663 working numbers. uAspire provided parent numbers for over 70 percent of students assigned to the text message intervention, though uAspire was not able to distinguish in its records whether these were land line or cell phone numbers. As a result only 232 of the uAspire parent numbers were working cell numbers. An advantage of the uAspire data is that we can observe the overlap between student and parent numbers. For a substantial portion of students from whom uAspire had been unable to collect student cell numbers, they were able to provide parent numbers. As a result, uAspire was able to provide either a student or parent number for 96 percent of students assigned to the text message intervention.[19]

In Tables 7 and 8, we explore several measures of intervention take-up for both the text message and peer mentor interventions. For the text message intervention, we indicate in Table 7 the proportion of students in the text message experimental group and in each site that replied to at least one message and that requested a meeting with a counselor in response to a text message. In Table 8, we report proportion of students that interacted with an advisor or in both the text and peer mentor interventions. We define each of these measures at the level of the student; that is, a student would be coded as having replied to at least one message if either she or her parent responded to a message.

Text message response rates varied across sites. Approximately 31 percent of students assigned to the text messaging intervention in Dallas responded to at least one message, compared with 34 percent in

[17] We report the uAspire delivery rates across all three sites, as this is how the data were recorded in the Reify database.

[18] Reify was not able to verify that the number belonged to the specific student to whom it was linked in the data, nor that the messages were necessarily delivered to or opened on the phone linked to that number.

[19] We are working with Reify to identify the extent of overlap between student and parent numbers in the Dallas ISD data, and also to confirm for what proportion of the treatment group students in each agency Reify received working numbers (either student or parent).

Springfield, 37 percent in Boston, and 48 percent in Lawrence.[20] The proportion of students requesting help from a school counselor in response to a text message was considerably lower. Eleven percent of students in Dallas requested help from a school counselor while fewer than six percent of students assigned to the treatment group actually interacted with a school counselor. Based on the counselor interaction logs, the gap between the proportion of students in Dallas who requested help via text message and who actually received assistance from a counselor appears to be primarily a function of counselors not contacting students until several days passed from when the student requested help.[21] At that stage, the student was often not responsive to counselor outreach.

In the uAspire sites, by contrast, the proportion of students who worked with a counselor approached or even exceeded the share of students who requested help via text message. In Boston, 19 percent of students requested help from a school counselor, while 23 percent of students actually interacted with a counselor. In Lawrence, 31 percent of students requested help from a school counselor, while 29 percent of students actually interacted with a counselor. The analogous figures in Springfield are 16 and 20 percent. The considerably higher alignment between actual meetings and meeting requests may be attributable to the strong relationship that many uAspire students have with the organization overall and, in many cases, with a specific advisor. One plausible explanation for why meeting rates exceeded meeting request rates is that after receiving text messages, students contacted uAspire directly, rather than request help via text message. For example, across uAspire sites, of students in the text message group who did interact with a counselor, 22 percent never requested a counselor meeting via text message.

By construction, students in the peer mentor group did not reply to any messages or request a meeting with an advisor via text message. But their rates of interaction with an advisor or peer mentor were substantially higher than for students in the text message treatment group. Across sites, between 50 and 60 percent of students assigned to receive peer mentor outreach interacted with either a mentor or advisor during the summer. An important question to consider, however, is what proportion of these students' interactions were with peer mentors vs. advisors? As we describe above, peer mentors were the first line of contact with students, but could refer students to an advisor for more expert assistance. Given the positive impacts we observed in the summer 2011 counseling intervention in Boston, it may be that the more students were referred to an advisor, the more one might expect a positive impact of the peer mentor intervention on students' outcomes. It is harder to predict the impact that peer mentor interactions

[20] It is worth noting that these response rates are out of all students assigned to the intervention, not just the subset of students to whom Reify was able to send messages. Response rates for the subset of students for whom Reify received either a student or parent number would be higher. This is particularly true in Dallas where Reify only received student numbers for 56 percent of the treatment group. Furthermore, the parent numbers came from the same source as the student numbers (the high school exit survey), so it is less likely that there would be a substantial number of students from whom Dallas ISD obtained parent but not student numbers.

[21] Based on conversations with counselors, the delay in their response to students' requests for help appears to be mainly a function of the counselors having large caseloads (inclusive of the intervention focused on FAFSA completion) and limited hours in the summer to devote to both interventions.

alone may have had on students' college decisions. For the reasons we outline earlier, it is possible that peer mentors would positively influence whether students went to college. Nevertheless, by virtue of having less experience and training than advisors, it is also possible that they would struggle to help students overcome some of the more complicated barriers to enrollment they encountered during the summer.

In Table 9, we examine the proportion of students assigned to each experimental group that interacted with a peer mentor or advisor, as well as the number of interactions that students had with peer mentors and advisors in the uAspire and Mastery sites.[22] As we illustrate in Table 9, a considerably higher proportion of students in the peer mentor group interacted with either a peer mentor or advisor than students in the text or control groups.[23] What is most striking, however, is that students in the text message group were more than twice as likely to have met with an advisor than students in the peer mentor group (22.3 percent vs. 11.1 percent). They also had more interactions: 0.338 on average for students in the text group, compared with 0.145 for students in the peer mentor group. Peer mentor interaction rates are similar between Mastery and uAspire.

A potentially important aspect of the text message intervention was the institution- and task-specific web links included in the personalized messages, since these links may have facilitated students completing required tasks in the moment, directly from their phones. Across tasks and sites, click-through rates were modest relative to the total number of students and parents to whom Reify was able to send messages. For more specific details, see Appendix A.

Regression results

We begin in Table 10 with the impact of the text message interventions on college enrollment across all four sites. Columns 1 and 2 present impacts on overall enrollment; columns 3 and 4 present impacts on enrollment in four-year institutions; and columns 5 and 6 present impacts on enrollment in two-year institutions. The first column of each pair presents uncontrolled results of regressing each outcome on the text indicator and fixed effects for the level of randomization, and the second column presents the results for fully-controlled models.[24] The coefficients in the table are marginal effects from probit models. Across outcomes, the treatment coefficients are stable to the inclusion of a full set of covariates, which provides further indication that students were equivalent at baseline across experimental groups. We do not find significant impacts of the text message intervention on either overall enrollment or enrollment at four-year institutions, however we do find a positive impact on enrollment at two-year institutions. Students in the text message group were nearly three percentage points more likely to enroll

[22] At the time of writing, we did not yet have access to interaction log information for Dallas.
[23] Very few students in the text message or control groups met with a peer mentor during the summer.
[24] Students in the peer mentor intervention are retained in the analysis here in order to improve precision of our estimates. Therefore, the model also includes a dummy variable for assignment to the peer mentor intervention, but this model is estimated only within those sites that included a text message intervention.

at two-year institutions than students in the control group. In Table 11, we present analogous results for the peer mentor intervention, and observe that students assigned to receive peer mentor outreach were 4.5 percentage points more likely to enroll in a four-year institution in the fall after high school graduation.

In Table 12, we present analogous results, disaggregated by site. Important to note is that in Table 12, and all subsequent tables, we pool the Lawrence and Springfield data. We do so for two primary reasons: first, as we demonstrated in the descriptive information presented in Tables 1, 2 and 3, these communities were much more similar to each other on a host of characteristics related to college attainment than either site was to Boston. Second, as we show in Appendix Table A3, the magnitude of the overall enrollment impacts are quite similar across both sites, and pooling them increases our statistical power to detect an impact across Lawrence and Springfield.

In Dallas, we find a pronounced impact of the text intervention on whether students enrolled at two-year institutions. Students in the treatment group were almost five percentage points more likely to enroll at two-year institutions than students in the control group. This impact was somewhat offset by the fact that students in the text treatment group were 3.1 percentage points less likely to enroll at four-year institutions (though this difference was not significant), so the overall enrollment impact is not significant. Across enrollment outcomes in Boston, the coefficients on the text treatment indicator trend negatively, but none is significant. By contrast, the coefficients on the peer mentor intervention in Boston are positive, particularly for four-year enrollment, though again not surpassing the margin of significance. In the pooled Lawrence and Springfield results, the text intervention had a particularly pronounced impact: students in the text treatment group were 7.1 percentage points more likely to enroll in college (column 7), with this impact roughly equally divided between increases in four-year and in two-year enrollment. As in Boston, the coefficients on the peer mentor intervention in Lawrence and Springfield are positive, particularly for four-year enrollment, but again not significant. The peer mentor impacts in Philadelphia are small and not significant.

In the bottom row of Table 12, we present the p-value on a χ^2 test assessing whether the impacts of the text message and peer mentor interventions were equivalent. In Boston, we find that the peer mentor intervention, while not significantly different from the control group, did have a significantly larger impact on students' overall enrollment and enrollment at four-year institutions than did the text message intervention. We do not, however, find differences between the text message and peer mentor interventions in the pooled Lawrence and Springfield results.

In Table 13, we examine whether impacts on overall enrollment are heterogeneous across demographic characteristics for the cross-site, pooled sample of students and within each of the five

sites.[25] We examine the impact of the intervention by free / reduced price lunch status (rows 1 and 2); gender (rows 3 and 4); quartile of high school GPA (rows 5 – 8); whether or not students had articulated specific postsecondary plans (rows 9 and 10); and for the uAspire sites, the extent to which students interacted with a uAspire advisor during the academic year (rows 9 and 10). While we do not observe impacts by free / reduced lunch status in the pooled sample, we find significant impacts of the text intervention on overall enrollment for FRL students in Dallas. FRL students in the text treatment group were 4.1 percentage points more likely to enroll in college than their counterparts in the control group. Across sites, peer mentor outreach is particularly beneficial for males, increasing on-time college matriculation by 7.2 percentage points. Disaggregated by site, this result is driven by large and statistically significant impacts of the peer mentors in the Springfield and Lawrence samples.

In order to examine variation in impacts by academic achievement, we utilize quartile indicators, because we reason that the impact of treatment may depend non-linearly on these measures of achievement. For instance, we might expect the interventions to be less impactful for students with either particularly high or low academic achievement, since their college plans (or lack thereof) would plausibly be less elastic to the offer of additional information and support. Indeed, in Dallas, we find that the text intervention has positive and significant impacts for students in the middle of the GPA distribution and for students in the second quartile of the mathematics assessment distribution.[26]

Across the uAspire sites, we find pronounced impacts of both interventions for students who did not have college plans as of high school graduation, and for students who had fewer than four meetings with a uAspire advisor during the academic year. In Boston, the coefficients on the text treatment for both sub-groups are positive, though not significant. The peer mentor intervention had a pronounced impact on students for whom uAspire did not have a record of specific college plans as of high school, increasing their overall enrollment by 11.8 percentage points. In the pooled Lawrence and Springfield data, the text intervention increased overall enrollment for students without specific college plans by 11.3 percentage points, and enrollment for students who met fewer than four times with a uAspire advisor by 14.6 percentage points, relative to the control group.[27] The peer mentor intervention increased overall enrollment for students in Lawrence/Springfield without specific college plans by 16.0 percentage points,

[25] For the peer mentor intervention, we also examined whether being assigned a mentor who graduated from the same high school or attended the same institution where the student planned to enroll differentially impacted students' outcomes. There were relatively few students who were assigned a peer mentor who attended the same high school (37) or was enrolled at the student's intended college (33). The direction of the impacts within these sub-groups are positive though obviously very noisy.

[26] We find suggestive evidence of a negative impact of the peer mentor intervention on students in the lowest GPA quartile in Philadelphia and evidence of a positive impact for students in the upper GPA quartiles. However, given the small number of students within each quartile and because of the potential to find spurious results from multiple testing, we are hesitant to place too much emphasis on these differences.

[27] Though not displayed in the table, these results were driven entirely by increasing enrollment at two-year institutions.

and enrollment for students who met fewer than four times with a uAspire advisor by 10.8 percentage points, relative to the control group.[28] χ^2 tests assessing equivalence of the impacts of the text message and peer mentor interventions indicate that neither intervention method was more successful than the other.

We conduct two sensitivity tests for the positive impacts we observe in Lawrence and Springfield.[29] First, we capitalize on records for whether uAspire had a student or parent phone number for each student to confirm whether the text message treatment impacts, in particular, were driven by the subset of students whom Reify should have been able to message. We expect to find a larger impact for the subset of students with numbers than for the overall sample, since the overall sample impact will be attenuated by the inclusion of students in the treatment group who did not actually receive the intervention. Similarly, we should find no impact of the text intervention for students for whom uAspire did not have a student or parent number, since these students would not have received any text outreach. Because peer mentors could have used a variety of outreach strategies, we may still expect impacts of the peer mentor intervention regardless of cell phone number. Second, we investigate whether the overall enrollment impacts are consistent with the enrollment impacts we observe for the subset of students who intended to matriculate at an institution that participates in the National Student Clearinghouse. One potential concern with relying on the NSC for outcome data is that students may enroll in a higher education institution that does not participate in the NSC. If students in the treatment or control groups were differentially more likely to attend one of these institutions, our results could be biased. To the extent that students enroll at their intended institution[30], examining the treatment impacts for the subset of students who planned to enroll at an NSC-matched institution may provide a benchmark for how much lack of full coverage in the NSC data could bias our program estimates.

In Lawrence/Springfield, we find a similar impact of the text intervention for the subset of students for whom uAspire had a number. We find no impact in Lawrence/Springfield for the subset of students for whom uAspire did not have a number. And for both the text and peer mentor interventions, the magnitude of the treatment impact for students intending to enroll at an NSC-matched institution was similar to the impact in the overall sample. These results are presented in Table A5.

V. DISCUSSION

The summer 2012 text messaging and peer mentor outreach campaigns both had a positive impact on whether college-intending high school graduates from urban school districts enrolled in college. Text

[28] The impact for students without specific college plans was driven entirely by inducing students to enroll at two-year institutions, while the impact of the peer mentor intervention for students with fewer than four meetings during the academic year were equally divided between two- and four-year enrollment.

[29] We are unable to conduct these analyses in Dallas because we lack the student-level cell phone and college intentions data necessary for these tests.

[30] This may be an overly strong assumption. For instance, in our 2011 summer college counseling intervention, only 73 percent of control group students enrolled at their intended college.

outreach increased enrollment in two-year institutions by over three percentage points, while peer mentor outreach increased four-year enrollment by 4.5 percentage points. These overall results mask considerable impact heterogeneity which begins to shed light on for whom and the conditions under which these types of interventions may be particularly beneficial. Students in the Dallas Independent School District who were assigned to receive text messages were 4.9 percentage points more likely to enroll at a two-year college than students who were assigned to the control group. The impacts in Dallas ISD were concentrated among students who qualified for free/reduced price lunch and students who fell in the middle of the achievement distribution as measured by GPA and standardized test performance. In Lawrence and Springfield, Massachusetts, students in the text message treatment group were 7.1 percentage points more likely to enroll overall in college, with this impact equally divided between enrollment at four-year and two-year institutions. The peer mentor impacts in Lawrence and Springfield were largest among male students, and across the uAspire sites, both text and peer mentor impacts were largest among students who worked only modestly with a uAspire advisor during the academic year and students who began the summer without specifically-articulated postsecondary plans. Among these students, the impact of the text message intervention was on the order of 11 to 14 percentage points and the impact of the peer mentor intervention of 11 to 16 percentage points. In Boston, we observe suggestive evidence of positive impacts of the text campaign and positive impacts of the peer mentor intervention among those students with no specified postsecondary plans.[31]

Previously, we posed several hypotheses for how the text messaging and peer mentor interventions could impact students' outcomes. Qualitative work on which we are collaborating with Professor Karen Arnold at Boston College will serve to deepen our understanding of this question. As that work is not yet available, here we rely on existing information to explore each of these hypotheses.

Regarding the text intervention, one possibility is that text messages efficiently connected students to school counselors who helped them address obstacles to enrollment. We do not find strong support for this hypothesis. In Dallas, fewer than six percent of students assigned to the text message intervention had substantive interaction with counselors, so it is hard to imagine that individualized support from counselors drove the enrollment impacts we observed in Dallas. Across the uAspire sites, the rates of substantive interaction with an advisor were considerably higher, ranging from 20 to 30 percent of the text group across sites. Nevertheless, while the rate of advisor interaction for students in the text group in Boston, 23 percent, was on par with that in Lawrence and Springfield, we observe no impact of the intervention in Boston. uAspire is very coherent and consistent in its advisor hiring guidelines and training protocols across sites, so the quality of and approach to advising should not differ

[31] We find suggestive evidence that the text intervention decreased enrollment among Boston students who had had more interaction with a uAspire advisor during the academic year. Nevertheless, out of a number of sub-group analyses we conducted in Boston, this is the only one for which we detected a significant, negative treatment impact, so we are hesitant to place much emphasis on this result.

greatly across sites. If anything, we would expect the Boston advisors to have a greater impact, given the higher volume of support resources and the presence of uAspire senior leadership within the Boston office. The positive impact of students working with a uAspire advisor in Boston was certainly evident in the summer 2011 college counseling intervention we described earlier. Together, we find little evidence to support the hypothesis that the text message impacts were driven by facilitating connections between students and counselors.

Another possibility is that the text messages increased students' access to information about required college tasks they needed to complete, and/or simplified this information so it was easier for students to digest. We find some evidence to support this hypothesis. As we showed earlier, we did observe a moderate amount number of click-throughs for the task- and college-specific web links included in each text message. We cannot identify whether message recipients were actually completing tasks when they clicked through these links or just learning more about the required task, but this data does provide some evidence that the text intervention may have increased students' and parents' access to information about the tasks they needed to complete. The fact that the text message impacts in Lawrence and Springfield were largest for students with undefined college plans and who had met fewer times with a uAspire advisor during the year suggests that the intervention may have been most beneficial for students who had less concrete information about their college plans. Interestingly, however, these students received generic reminders of important tasks to complete (e.g. "register for orientation") but not college-specific dates or web-links. Therefore, the messages themselves may have increased students' awareness or comprehension of required tasks to matriculate in college, and may have encouraged students to seek out more information via the college website, re-visit information they had received directly from the college, or contact a staff member at the college. Our qualitative follow-up will inform whether students responded in any of these fashions to the text messages through our qualitative study.

The hypothesis that is hardest to evaluate from the information currently available is whether the text messages operated by prompting students to address tasks when they received the message rather than procrastinating and putting them off until later in the summer. This is a core area of inquiry for the qualitative study, though admittedly it will be difficult to accurately capture the time between when we sent the messages and when students completed tasks since we will be asking them about events six to seven months in the past.

For the peer mentor intervention, one of the hypotheses we articulated earlier is that students would be more responsive to outreach from peers, particularly if the peers used communication technologies prevalent among adolescents. At least compared to automated and personalized text messaging, we do find evidence that the peer mentor outreach resulted in substantially higher rates of interaction with students. For instance, in Boston, compared to the 23 percent of students in the text group who interacted with an advisor, 55 percent of students in the peer mentor group interacted with a peer

mentor or advisor. Nevertheless, these higher rates of interaction did not translate to substantially stronger impacts of the peer mentor intervention compared to the text intervention. This may be because almost all of peer mentor treatment group students' interactions were with peer mentors rather than advisors. While the peer mentors were successful at connecting to students, they may have been more limited in their ability to help students successfully overcome barriers to college enrollment. uAspire leadership identified several areas in which peer mentors struggled in providing effective support to students. For instance, peer mentors struggled to answer students' financial aid questions. They also frequently took students' confidence in their college plans at face value, rather than probing to investigate whether there were important tasks the student needed to complete but were unaware of. Finally, peer mentors had trouble assessing when the student with whom they were working would benefit from direct support from a uAspire advisor.

The other mechanisms we proposed for the peer mentor intervention are difficult to assess from our current data. In the follow-up qualitative study, we will examine whether students in the peer mentor group who did enroll in college were encouraged to do so either because the peer mentors changed their perceptions about the kind of students who enroll and succeed in college, or because the peer mentors provided them with a more concrete sense of the benefits of going to college.

Another important question pertaining to the text message intervention is why the direction of the effect in Boston was negative, even if insignificant. Following the summer 2011 counseling intervention, Arnold et al. (in progress) completed a series of focus groups and interviews with students and counselors to understand how the offer of counseling impacted students' decision-making; some of the themes from this study may inform the potential negative impacts of the text intervention in Boston on students' enrollment. During the counselor focus groups, uAspire advisors often noted that students had an unrealistic sense of their readiness for college. This could potentially emerge in a community that reinforces a strong college-going culture (including an encouragement campaign from the Mayor's Office) and that provides a range of school- and community-based college supports to students, but that does not necessarily help them anticipate all of the tasks they need to complete after high school graduation.

Advisors in the 2011 counseling intervention reported that they sometimes felt like "dream crushers" when they had to tell a student that their intended college would require them to borrow tens of thousands of dollars to cover the full cost of attendance. Yet, as one advisor said, after "bursting students' bubbles," they were able to help students follow through on their goal of going to college, either by reducing costs to the point that the loan burden would be more manageable at their intended college, or by identifying a more affordable college option for the student. One possibility with the text intervention is that the messages served the first function of "bursting students' bubbles," making them aware of all they would have to do in order to make their college plans a reality. Because the bubble-bursting was divorced

from the personal assistance from a uAspire advisor, however, the messages may not have served the second purpose of helping students identify an alternative college plan. We recognize that currently this explanation for the negative treatment effects in Boston is speculative. Nevertheless, our hope is that the results of the follow-up qualitative study will shed additional light on how students in Boston responded to the text messages.

Finally, both interventions appeared to benefit students with undefined college plans and fewer meetings with uAspire advisors before high school graduation. This trend would be consistent with the hypothesis that students who are not as far along in their college planning (and therefore potentially facing unresolved financial aid issues or a lack of awareness of required summer tasks) could be particularly responsive to personalized information and assistance.

Perhaps the most striking feature of the interventions, and particularly the text messaging intervention, is their cost-effectiveness. There were two primary expenditures to implement the text campaign. The first was the cost of message delivery. Including the cost of up-front system design and the per-message delivery charges, the total messaging cost per student in the Dallas and uAspire treatment groups was approximately $2, or roughly $5,000 across both sites. The other primary expense was compensation for counselors to staff the summer intervention, which brought the per-student cost of the intervention to a mere $7 per student. The costs of the peer mentor intervention were primarily hourly wages to the peer mentors themselves and salary for supervising advisors. Together, the peer mentor intervention cost approximately $80 per student and so is more similar in cost to counselor-led interventions.

In Table 14, we compare the per-participant costs and enrollment impacts for the text intervention to several related interventions that provided personalized information and assistance to high school seniors and graduates: the summer 2011 college counseling interventions we conducted in Boston, MA and Fulton County, GA; the H&R Block FAFSA experiment that provided families assistance completing the FAFSA as part of the tax return process (Bettinger et al., 2012); and two programs that matched college students with high school seniors to help them complete college applications (Berman, Ortiz, & Bos, 2008; Carrell & Sacerdote, 2012). It is important to note that these interventions were considerably different in design and served populations quite different from the text campaign, so our estimates should be interpreted as rough comparisons of impact on college-going per dollar invested in each program.

Compared to these interventions, the text messaging campaign is a cost-effective strategy for increasing college enrollment. The summer college counseling interventions had slightly larger impacts (5 – 8 percentage points), but also cost more ($100 - $200 per participant). The college mentoring programs also had larger impacts, particularly the New Hampshire program, which increased enrollment for females and recent immigrants by twelve percentage points. Yet, these programs were considerably more expensive than both the text campaign and the summer college counseling interventions, at $500 - $1,000

per student. In terms of impact per dollar spent, the H & R Block FAFSA experiment is the most cost-effective comparison: offering adults assistance with completing the FAFSA as part of income tax preparation cost $88 per participant, and increased enrollment by 8 percentage points. Even compared to the H & R Block experiment, however, the text campaign appears to be a particularly low-cost approach to increase enrollment among traditionally underrepresented populations in higher education, with a 3 – 7 percentage point increase in enrollment for an investment of $7 per participant.

An important point about several of the studies we describe in Table 14 is that the authors have demonstrated that the interventions increased not only college entry, but also persistence. Both Bettinger et al. (2012) Carrell & Sacerdote (2012) show that differences in college participation between treatment and control groups persist for at least two years following high school. Castleman, Page, & Schooley (2012) find even more pronounced impacts of summer college counseling on sophomore fall persistence than on overall enrollment. While the offer of summer counseling increased immediate enrollment in Boston by 5.1 percentage points, it increased continuous enrollment through the first three semesters in college by 8.8 percentage points.

It is clearly an open and essential question whether the text intervention will have a similarly long-term impact on students' outcomes. If all the text intervention is doing is inducing students into college, only to have them drop about several months later, the intervention could conceivably be doing harm, since students may have incurred debt to matriculate but have little to show for it in terms of additional education. While it is encouraging that the summer 2011 college counseling intervention had pronounced impacts on sophomore year persistence, it is possible that the text intervention impacted students' enrollment through different channels, and may therefore not have as persistent an impact on students' enrollment. We expect to track students' enrollment patterns over time.

In thinking about how to replicate or expand on these interventions, several important lessons emerge. A core challenge to text message interventions is obtaining students' or parents' cell phone numbers. Our strategy of relying on high school exit surveys was somewhat effective, but only six in ten of our targeted students in Dallas provided these numbers. Especially if one considers the possibility of messaging students at earlier stages in their educational trajectories, school districts may also feel it is more important (or legally mandated) to obtain informed consent from parents, which could create a further impediment to collecting numbers from a large portion of the target population. Utilizing existing data collection points (e.g. beginning-of-year parent registration, or college entrance examination registration) may be an effective approach for increasing the number of students who can be messaged. Another challenge to the text message intervention is persuading recipients of the intervention's credibility. This was less of a challenge in the uAspire sites, where the first text students received was signed by their academic year advisor, and more so in Dallas ISD, where the first message was signed by head of school counseling. A common response to the text messages in Dallas was, "Who's this?" Having

a strategy in place to inform recipients of the message campaign's intent, and to persuade them that the messages are coming from someone they can trust, are important considerations to increase the likelihood of the program's success.

Regarding the peer mentor intervention, the peer mentors were effective at connecting to students and interacting with them about their college plans. These interactions may have had value in their own right by shifting students' perceptions of the social norms of college-going or by concretizing the benefits of college for students. The peer mentors may not have had the capacity, however, to help students address more complicated barriers to their successful matriculation. A future peer mentor intervention that harnesses the success with which peer mentors can reach students, but that has better systems in place to connect students to professional assistance when they need help, could have a more pronounced impact on students' college enrollment decisions.

Compared to the text message intervention, a challenge and cost of a peer mentor outreach strategy comes in the form of management needs. Our primary contacts for both uAspire and Mastery indicated that the peer mentors required substantial encouragement, oversight and management. For agencies interested in implementing a peer mentor model, these needs should be planned for.

Conclusion

In closing, the results we present presented here have significant implications for policy, practice, and research. Gaps in college enrollment and success by socioeconomic status have persisted for decades and have widened among recent cohorts (Bailey & Dynarski, 2012). School districts are under mounting pressure to increase college-going rates among underrepresented populations. Yet, districts often have limited resources with which to invest in initiatives to improve college access. Personalized text messaging and to a lesser degree peer mentor outreach combined with access to professional assistance may be particularly affordable and effective strategies to increase college going among students from low- and moderate-income backgrounds. Our analyses demonstrate that the text messaging campaign has a substantial impact on whether students enroll in college, particularly relative to its cost. And the peer mentor intervention, while impacts are less precisely estimated here, may have had sizable impacts on certain sub-groups.

More broadly, as schools and governments grapple with limited and, in some cases, declining budgets, practitioners and policymakers will need to develop low-cost, high-impact strategies to help low-income students and their families select and continue along educational pathways that prepare them for future success. The text messaging model, in particular, as a strategy to consolidate and personalize complex information and to facilitate connections between students, families, and school officials, could conceivably be applied to many stages in students' educational pathways: when they are choosing which primary or secondary schools to attend, which courses to take, and to which colleges to apply. Our results illustrate both the feasibility and impact of a text message campaign and serve to the set the stage for

policymakers and practitioners to use similar strategies to support students in making better educational decisions and smoother transitions throughout their educational trajectories.

Works Cited

Arnold, K.C., Castleman, B.L., Chewning, A., & Page, L.C. (in progress). Counselor and student reflections on post-high school college-going outreach and support.

Arnold, K.C, Fleming, S., DeAnda, M., Castleman, B.L., & Wartman, K.L. (2009). The summer flood: The invisible gap among low-income students. *Thought and Action, Fall 2009*: 23-34.

Avery, C., & Kane, T.J. (2004). Student perceptions of college opportunities. The Boston COACH program. In C. Hoxby (ed.). *College choices: The economics of where to go, when to go, and how to pay for it.* Chicago: University of Chicago Press.

Bailey, M.J., & Dynarski, S.M. (2012). *Gains and gaps; Changing inequality in U.S. college entry and completion.* National Bureau of Economic Research Working Paper No. 17,633. Cambridge, MA.

Becker, G.S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education.* Chicago: University of Chicago Press.

Beshears, J., Choi, J.J., Laibson, D., & Madrian, B.C. (2012). *Simplification and saving.* National Bureau of Economic Research Working Paper No. 12,659. Cambridge, MA.

Berman, J., Ortiz, L., & Bos, J. (2008). *Evaluation of the SOURCE program: An intervention to promote college application and enrollment among urban youth.* Berkley Policy Associates.

Bettinger, E., Long, B.T., Oreopoulos, P., & Sanbonmatsu, L. (2012). The role of application assistance and information in college decisions: Results from the H&R Block FAFSA experiment. *Quarterly Journal of Economics*, *127*(3): 1205-1242.

Boldero, J., & Fallon, B. (1995). Adolescent help-seeking: What do they get help for and from whom? *Journal of Adolescence 18:* 193-209.

Carrell, S., & Sacerdote, B. (2012) Late interventions matter too: The case of college coaching in New Hampshire. Paper presented at the Summer Institute of the National Bureau of Economic Research.

Casey, B., Jones, R.M., & Somerville., L.H. (2011). Braking and accelerating of the adolescent brain. *Journal of Research on Adolescence 21*(1)*:* 21 – 33.

Castleman, B.L. (2013). Assistance in the 11th hour: Experimental interventions to mitigate summer attrition among college-intending high school graduates. Unpublished dissertation. Harvard Graduate School of Education.

Castleman, B.L., Arnold, K.C., & Wartman, K.L. (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. *The Journal of Research on Educational Effectiveness 5*(1): 1 – 18.

Castleman, B.L., & Page, L.C. (forthcoming). A trickle or a torrent? Understanding the extent of summer "melt" among college-intending high school graduates. *Social Sciences Quarterly.*

Castleman, B.L., Page, L.C., & Schooley, K. (2012). *The Forgotten Summer: The impact of college counseling the summer after high school on whether students enroll in college*. Paper presented at the Annual Meeting of the Association for Public Policy Analysis and Management.

Chabris, C., Laibson, D., & Schuldt, J. (2008). Intertemporal choice. *Palgrave Dictionary of Economics.*

Cialdini, R.B. (2001). *Influence: Science and practice.* Boston, MA: Allyn & Bacon.

Cialdini, R.B., & Goldstein, N.J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology 55:* 591-621.

Civic Enterprises. (2011). School counselors literature and landscape review. The College Board.

Cohen, G. L., & Garcia, J. (2005). we am us: Negative stereotypes as collective threats. *Journal of Personality and Social Psychology 89:* 566 –582.

Cooper, H., Nye, B., Charlton, K., Lindsay, J., & Greathouse, S. (1996). The effects of summer vacation on achievement test scores: A narrative and meta-analytic review. *Review of Educational Research 66:* 227-268.

Daugherty, L. (2011). *An evaluation of Summer Link, a counseling program to facilitate college-going.* Paper presented at the Annual Meeting of the Association for Public Policy Analysis and Management. Washington, D.C.

Dubois, D. L., Holloway, B. E., Valentine, J. C., & Harris, C. (2002). Effectiveness of mentoring programs for youth: A meta-analytic review. *American Journal of Community Psychology 30*(2): 157-197.

Dynarski, S.M., & Scott-Clayton, J.E. (2006). The cost of complexity in federal student aid: Lessons from optimal tax theory and behavioral economics. *National Tax Journal 59*(2): 319-356.

Dynarski, S.M., Hemelt, S., & Hyman, J. (2012). *Data Watch: Using National Student Clearinghouse data to track postsecondary outcomes.* Paper presented at the Annual Meeting of the Association for Public Policy Analysis and Management.

Entwisle, D. R., Alexander, K. L., & Olson, L. S. (1997). *Children, schools, and inequality*. Boulder, CO: Westview Press.

Gandara, P., & Mejorado, M. (2005). Putting your money where your mouth is: mentoring as a strategy to increase access to higher education. In Tierney, W.G., Corwin, Z.B., & Colyar, J.E. (eds.). *Preparing for college: Nine elements of effective outreach.* Albany, NY: State University of New York Press.

Gibbs, N. (November 30, 2009). The growing backlash against overparenting. *Time Magazine.*

Grodsky, E., & Jones, M. T. (2007). Real and imagined barriers to college entry: Perceptions of cost. *Social Science Research 36*(2): 745–766.

Grossman, J.B., & Tierney, J.P. (1998). Does mentoring work? An impact study of the Big Brothers/Big Sisters. *Evaluation Review 22:* 403-426.

Horn, L., Chen, X., & Chapman, C. (2003). *Getting ready to pay for college: What students and their parents know about the cost of college tuition and what they are doing to find out.* U. S. Department of Education, National Center for Education Statistics: Washington, D.C.

Hossler, D., & Gallagher, K. S. (1987). Studying student college choice: A three-phase model and the implications for policymakers. *College and University*, *62*(3): 207–221.

How to talk like an admissions dean. (2001, September). Swarthmore College bulletin. Swarthmore, PA: Swarthmore College.

Lovelace, K., & Rosen, B. (1996). Differences in achieving person-organization fit among diverse groups of managers. *Journal of Management 22*: 703–722.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica 47*(2): 263–291.

Karcher, M.J. (2005a). Cross-age peer mentoring. In D.L. DuBois & M.J. Karcher (Eds.), *Handbook of youth mentoring.* (pp. 266–285). Thousand Oaks, CA: Sage.

Karcher, M.J., Kuperminc, G.P., Portwood; S.G., Sipe, C.L., & Taylor, A.S. (2006) Mentoring programs: A framework to inform program development, research, and evaluation. *Journal of Community Psychology 34*(6): 709-725.

Karlan, D., McConnell, M., Mullainathan, S., & Zinman, J. (2010). *Getting to the top of mind: How reminders increase saving.* National Bureau of Economic Research Working Paper No. 16,205. Cambridge, MA.

Keating, D. P. (2004). Cognitive and brain development. In R.M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (2nd ed., pp. 45-84). New York: Wiley.

Krishna, S., Boren, S.A., & Balas, E.A. (2009). Health care via cell phones: A systematic review. *Telemedicine and e-health 15*(3): 231-240.

Lenhardt, A. (2012). *Teens, smart phones, and texting.* Washington, D.C.: Pew Research Center.

Madrian, B.C., & Shea, D.F. (2000). *The power of suggestion: Inertia in 401(K) participation and savings behavior.* National Bureau of Economic Research Working Paper No. 7,682. Cambridge, MA.

Matsudaira, J. (2008). Mandatory summer school and student achievement. *Journal of Econometrics 142* (2): 829-850.

Matthews, C., Schooley, K, & Vosler, N. (2011).Proposal for a Summer Transition Program to Increase FCS College-Going Rates, Feb 14, 2011, Fulton County Schools, Fulton County, GA.

Milkman, K.L., Beshears, J., Choi, J.J., Laibson, D, & Madrian, B.C. (2012). *Following through on good intentions: The power of planning prompts.* National Bureau of Economic Research Working Paper No. 17995. Cambridge, MA.

Mullainathan, S. (2011). The psychology of poverty. *Focus 28(1):* 19 – 22.

Murray, D.M., Luepker, R.V., Johnson, A.C., & Mittelmark, M.B. (1984). The prevention of cigarettesmoking in children: A comparison of four strategies. *Journal of Applied Social Psychology 14*(3): 274–88.

Newman, R. S. (1994). Adaptive help seeking: A strategy of self-regulated learning. In Schunk, D., and Zimmerman, B. (eds.), *Self-Regulation of Learning and Performance: Issues and Educational Applications*, Hillsdale, NJ: Lawrence Erlbaum Associates.

Pallais, A. (2009). *Why not apply? The effect of application costs on college applications for low-income students.* Paper presented at the Annual Meeting of the American Economic Association.

Rhodes, J.E., Grossman, J.B., & Resch, N.L. (2001). Agents of change: Pathways through which mentoring relationships influence adolescents' academic adjustment. *Child Development 71*(6): 1662-1671.

Roderick, M., Nagaoka, J., Coca, V., Moeller, E., Roddie, K., Gilliam, J., & Patton, D. (2008). *From high school to the future: Potholes on the road to college.* Chicago, IL: Consortium on Chicago School Research.

Ryan, A.M., & Pintrich, P.R. (1997). Should we ask for help? The role of motivation and attitudes in adolescents' help seeking in math class. *Journal of Educational Psychology 89*: 329-341.

Schneider, B. (2009). *College choice and adolescent development: Psychological and social implications of early admission.* Arlington, VA: National Association for College Admissions Counseling.

Scott-Clayton, J. (2011). *The shapeless river: Does a lack of structure inhibit students' progress community colleges?* CCRC Working Paper No. 25. New York: Community College Research Center, Teachers College, Columbia University.

Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin 133*(1)*:* 65 – 94.

Steinberg, L. (2005). *Adolescence.* New York: McGraw Hill Press.

Steinberg, L. (2008). A social neuroscience perspective on adolescent risk-taking. *Development review 28: 78-106.*

Steinberg, L., Cauffman, E., Woolard, J., Graham, S., & Banich, M. (2009). Are adolescents less mature than adults? Minors' access to abortion, the juvenile death penalty, and the alleged APA "Flip-Flop." *American Psychologist 64:* 583-594.

Stockwell, M.S., Kharbanda, E.O., Martinez, R.A., Vargas, C.Y., Vawdrey, D.K., Camargo, S. (2012). Effects of a text messaging intervention on influenza vaccination in an urban, low-income pediatric and adolescent population. *Journal of the American Medical Association 307*(16): 1702-1708.

Subrahmanyam, K., & Greenfield, P. (2008). Online communications and adolescent relationships.*Future Child 18*(1): 119-146.

Thaler, R., & Sunstein, C. (2008). *Nudge: Improving decisions about health, wealth, and happiness*, Yale University Press, New Haven, 2008

Thompson, L., & Kelly-Vance, L. (2001). The impact of mentoring on the academic achievement of at-risk youth. *Children and Youth Services Review 23*(3): 227–242.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition.* Chicago, IL: University of Chicago Press.

Walton, G.M., & Cohen, G.L. (2007). A question of belonging: Race, social fit, and achievement. *Journal of Personality and Social Psychology 92*(1): 82-96.

White, K. M., Hogg, M. A., & Terry, D. J. (2002). Improving attitude-behavior correspondence through exposure to normative support from a salient in-group. *Basic and Applied Social Psychology (24*): 91-103.

Tables

Table 1: Educational attainment and socioeconomic status, by site

	Dallas, TX	Boston, MA	Lawrence, MA	Springfield, MA	Philadelphia, PA
Four-year high graduation rate in 2011 (for Fall 2007 entering 9th grade cohort)	77.3	64.4	52.3	52.1	61.0
Percent of adults with a bachelor's degree or higher (2006 – 2010 average)	28.6	42.5	11.6	16.9	22.6
Percent of persons living below the poverty line (2006 – 2010 average)	22.3	21.2	26.5	27.6	25.6
Unemployment rate (May 2012)	6.9	5.7	13.1	9.4	10.2

Note: Educational attainment and poverty figures for Philadelphia are for years 2007 – 2011.
Sources: Texas Education Agency; Massachusetts Department of Elementary and Secondary Education; US Census Bureau; Texas Workforce Commission; Massachusetts Executive Office of Labor and Workforce Development; School District of Philadelphia, Office of Accountability; US Bureau of Labor Statistics.

Table 2: Summary statistics for baseline demographic characteristics, by site

	Dallas, TX		Boston, MA		Lawrence, MA		Springfield, MA		Philadelphia, PA	
	All HS seniors (1)	FAFSA completers (2)	uAspire seniors (3)	Seniors w/ ≥ 2 mtgs (4)	uAspire seniors (5)	Seniors w/ ≥ 2 mtgs (6)	uAspire seniors (7)	Seniors w/ ≥ 2 mtgs (8)	All HS seniors (9)	Seniors w/ college plans (10)
Female	0.51	0.56	0.59	0.60	0.61	0.63	0.58	0.59	0.54	0.56
			[2,528]	[1,823]	[475]	[291]	[844]	[635]		
Black	0.29	0.33	0.38	0.37	0.01	0.01	0.28	0.31	0.95	0.95
	[7,952]	[2,865]	[2,152]	[1,631]	[335]	[236]	[768]	[574]		
Hispanic	0.63	0.57	0.25	0.25	0.84	0.85	0.41	0.36	--	--
	[7,952]	[2,865]	[2,152]	[1,631]	[335]	[236]	[768]	[574]		
White	0.06	0.08	0.08	0.07	0.03	0.01	0.11	0.10	0.03	--
	[7,952]	[2,865]	[2,152]	[1,631]	[335]	[236]	[768]	[574]		
Other race/ethnicity	0.01	0.02	0.29	0.30	0.12	0.13	0.20	0.22	0.03	0.02
	[7,952]	[2,865]	[2,152]	[1,631]	[335]	[236]	[768]	[574]		
Qualified for free/reduced price lunch	0.78	0.79	0.78	0.78	0.89	0.88	0.78	0.76	0.65	0.65
			[2,152]	[1,568]	[318]	[236]	[686]	[526]		
Completed the FAFSA	0.36	1.00	0.74	0.88	0.64	0.85	0.71	0.84	--	0.95

Source: Dallas ISD, Mastery and uAspire administrative records (for Boston, Lawrence, and Springfield).

Notes: Means are shown with standard deviations in parentheses (for continuous variables only) and the number of observations in brackets if less than full sample. The experimental sample includes college-intending students, identified by completing the FAFSA (Dallas), meeting with an advisor at least twice during senior year of high school (uAspire), or reporting college intentions on a high school exit survey (Mastery). For uAspire sites, GPA is based on student self-report.

Table 3: Summary statistics for baseline academic achievement and college intention characteristics, by site

	Dallas, TX		Boston, MA		Lawrence, MA		Springfield, MA		Philadelphia, PA	
	All HS seniors (1)	FAFSA completers (2)	uAspire seniors (3)	Seniors w/ ≥ 2 mtgs (4)	uAspire seniors (5)	Seniors w/ ≥ 2 mtgs (6)	uAspire seniors (7)	Seniors w/ ≥ 2 mtgs (8)	All HS seniors (9)	Seniors w/ college plans (10)
Prior academic achievement										
Senior year GPA	3.29	3.38	--	--	--	--	--	--	2.56	2.86
	(0.21)	(0.18)							(1.04)	(0.65)
	[8,035]	[2,916]							[523]	[441]
State math assessment	0.00	0.29	--	--	--	--	--	--	0.00	0.05
	(1.00)	(0.89)							(1.00)	(0.985)
	[7,452]	[2844]							[310]	[285]
State ELA assessment	0.00	0.31	--	--	--	--	--	--	0.00	0.05
	(1.00)	(0.70)							(1.00)	(0.985)
	[7,452]	[2,844]							[310]	[285]
GPA < 2.0	--	--	0.13	0.11	0.16	0.13	0.17	0.15	--	--
			[1,868]	[1,448]	[304]	[226]	[563]	[425]		
GPA 2.0 – 3.0	--	--	0.42	0.41	0.37	0.34	0.44	0.42	--	--
			[1,868]	[1,448]	[304]	[226]	[563]	[425]		
GPA 3.0 – 4.0	--	--	0.46	0.48	0.47	0.53	0.40	0.43	--	--
			[1,868]	[1,448]	[304]	[226]	[563]	[425]		
Postsecondary intentions										
Intend on 2-year inst.	--	--	0.25	0.25	0.64	0.56	0.58	0.57		0.42
			[1,580]	[1,258]	[336]	[221]	[524]	[517]		[433]
Intend on 4-year public inst.	--	--	0.3	0.30	0.20	0.28	0.16	0.16		0.41
			[1,868]	[1,258]	[336]	[221]	[524]	[517]		[433]
Intend on 4-year private inst.	--	--	0.44	0.45	0.14	0.16	0.26	0.26		0.17
			[1,868]	[1,258]	[336]	[221]	[524]	[517]		[433]
N	8,066	2,920	2,574	1,843	487	294	981	696		443

Source: Dallas ISD, Mastery and uAspire administrative records (for Boston, Lawrence, and Springfield).

Notes: Means are shown with standard deviations in parentheses (for continuous variables only) and the number of observations in brackets if less than full sample. The experimental sample includes college-intending students, identified by completing the FAFSA (Dallas), meeting with an advisor at least twice during senior year (uAspire), or reporting college intentions on a high school exit survey (Mastery). For uAspire sites, GPA is based on student self-report. College intention information is currently unavailable for Dallas.

Table 4: Student assignment to experimental group, by site

	Dallas, TX	Boston, MA	Lawrence, MA	Springfield, MA	Philadelphia, PA
Text message	1,454	697	100	273	--
Peer mentor	--	450	94	150	240
Control	1,466	696	100	273	203
Total experimental sample	2,920	1,843	294	696	443

Notes: In Dallas, school counselors were first assigned to cover a set of high schools within the district. Students were then assigned to the treatment or control group within each counselor's cluster of high schools. In uAspire, students were assigned to each experimental group within each site. In the Mastery Charter Schools, students were assigned to each experimental group within each school.

Table 5: Assessment of baseline equivalence using probit (Dallas and Philadelphia) and multinomial logit (Massachusetts sites) regression to predict treat group assignment from baseline covariates

	Dallas	Boston		Lawrence		Springfield		Philadelphia
	Text group	Text group	Peer mentor group	Text group	Peer mentor group	Text group	Peer mentor group	Peer mentor group
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Demographic characteristics								
Female	-0.00 (0.02)	0.04 (0.11)	0.04 (0.13)	0.20 (0.32)	-0.30 (0.32)	-0.11 (0.19)	-0.06 (0.22)	-0.03 (0.05)
Black	-0.02 (0.04)	-0.16 (0.25)	-0.21 (0.28)	-1.61 (1.60)	-1.99 (1.62)	0.19 (0.35)	0.33 (0.43)	-0.13 (0.14)
Hispanic	-0.01 (0.04)	-0.28 (0.26)	-0.08 (0.29)	-1.33 (0.86)	-1.36 (0.88)	0.43 (0.35)	0.35 (0.42)	--
Other race/ethnicity	-0.10 (0.08)	-0.32 (0.26)	-0.25 (0.29)	-1.93~ (1.16)	-3.22~ (1.38)	0.60 (0.48)	-0.00 (0.66)	-0.44* (0.12)
Qualified for free or reduced lunch	-0.00 (0.02)	0.08 (0.15)	0.10 (0.17)	0.71 (0.58)	-0.35 (0.50)	-0.11 (0.24)	0.37 (0.31)	-0.05 (0.05)
Completed the FAFSA	--	-0.05 (0.17)	-0.19 (0.19)	0.27 (0.44)	0.46 (0.45)	-0.10 (0.25)	0.34 (0.32)	-0.08 (0.12)
Prior academic achievement								
Senior year GPA	-0.01 (0.07)	--	--	--	--	--	--	0.02 (0.05)
Standardized state assessment math score	0.01 (0.01)	--	--	--	--	--	--	0.02 (0.04)
Standardized state assessment ELA score	0.00 (0.02)	--	--	--	--	--	--	0.01 (0.04)
High school GPA 2.0 - 3.0	--	-0.23 (0.22)	-0.33 (0.24)	-0.14 (0.54)	0.25 (0.58)	0.10 (0.34)	0.25 (0.43)	--
High school GPA 3.0 - 4.0	--	-0.25 (0.22)	-0.57* (0.24)	-0.35 (0.55)	0.21 (0.59)	-0.26 (0.35)	0.09 (0.44)	--

Table 5, continued: Assessment of baseline equivalence using probit (Dallas and Philadelphia) and multinomial logit (Massachusetts sites) regression to predict treat group assignment from baseline covariates

	Dallas	Boston		Lawrence		Springfield		Philadelphia
	Text group	Text group	Peer mentor group	Text group	Peer mentor group	Text group	Peer mentor group	Peer mentor group
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Postsecondary intentions								
Intend to enroll at a four-year public inst.	--	-0.42* (0.19)	-0.40~ (0.21)	0.78~ (0.45)	0.76~ (0.45)	-0.07 (0.30)	-0.07 (0.35)	-0.02 (0.06)
Intend to enroll at a four-year private inst.	--	-0.32~ (0.17)	-0.16 (0.20)	0.98~ (0.56)	0.56 (0.57)	0.12 (0.26)	0.01 (0.30)	0 (0.08)
Provided a cell number to uAspire	--	0.08 (0.32)	0.35 (0.40)	--[1]	--	-0.34 (0.41)	0.11 (0.57)	--
Number of meetings with uAspire advisor	--	-0.01 (0.03)	0.04 (0.03)	-0.01 (0.06)	-0.01 (0.06)	0.00 (0.03)	-0.04 (0.04)	--
N	2,920	1,843		294		696		443
Fixed effects for level of randomization	✓	N/A		N/A		N/A		✓
p-value on χ^2 test for joint significance	0.997	0.559		0.682		0.864		0.718

~ p <0.10, * p<0.05, ** p<0.01, *** p<0.001
Source: Dallas ISD, Mastery and uAspire administrative records (for Boston, Lawrence, and Springfield).
Notes: Robust standard errors are reported in parentheses. Coefficients in columns 1 and 8 are coefficients from probit regressions. Coefficients in columns 2-4 are from multinomial logit models. The base outcome in columns 2 – 4 is students assigned to the control group. Models include indicator variables for missingness for any covariate with missing values.

Table 6: Text message delivery rates by intervention sites

	Dallas, TX	Boston, Springfield, and Lawrence MA
		(1)
Total students assigned to receive text messages	1,454	1,070
Total student cell numbers sent to text messaging platform	848	806
Total *working* student cell numbers sent to text messaging platform	814	768
Proportion of students assigned to receive messages for whom there were working student cell numbers	0.56	0.72
Total parent cell numbers sent to text messaging platform	781	711
Total *working* parent #s sent to text messaging platform	663	232
Proportion of students assigned to receive messages for whom there were working parent cell numbers	0.46	0.22
Proportion of students for whom Reify received a student *or* parent number	--	0.96

Source: Reify Health administrative data

Notes: Reify Health is the text messaging platform that delivered the text messages to students and parents. Reify Health reported the number of student and parent cell numbers they received from each intervention site at the start of the intervention. Reify Health also verified whether the numbers they received were working cell numbers, as opposed to land line numbers, no-longer-active cell numbers, or invalid phone numbers. Dallas ISD obtained student and parent numbers through a high school exit survey. uAspire obtained student and parent cell numbers for the Massachusetts intervention sites from a combination of exit surveys and advisors outreach to students. The Massachusetts delivery rates are grouped together because that is how they were recorded in the Reify Health database. We do not currently have access to data indicating for what proportion of students assigned to the text intervention in Dallas Reify received a student or parent number (last row).

Table 7: Text message response rates among students assigned to receive text message outreach, by site

	Dallas, TX	Boston, MA	Lawrence, MA	Springfield, MA
	(1)	(2)	(3)	(4)
Replied to at least one text message	0.308***	0.367***	0.480***	0.341***
	(0.012)	(0.018)	(0.050)	(0.029)
Replied to at least one text message to request an advising meeting	0.112***	0.192***	0.310***	0.161***
	(0.008)	(0.015)	(0.046)	(0.022)
N	2,920	1,843	294	696
Fixed effects for level of randomization	✓	N/A	N/A	N/A

~ p <0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: Dallas ISD and uAspire administrative records (for Boston, Lawrence, and Springfield sites).

Notes: Robust standard errors are reported in parentheses. The coefficients report marginal effects from probit regressions. Sample sizes reported here pertain to the full sample. Text message response rates, by construction, were 0 among students in the control group.

Table 8: Rate of counselor / advisor interaction, by site

	Dallas, TX	Boston, MA	Lawrence, MA	Springfield, MA	Philadelphia, PA
	(1)	(2)	(3)	(4)	(5)
Text message	0.057***	0.192***	0.180***	0.174***	--
	(0.006)	(0.026)	(0.055)	(0.039)	
Peer mentor	--	0.516***	0.443***	0.480***	0.571***
		(0.031)	(0.060)	(0.054)	(0.038)
Control group meeting rate	0.00	0.04	0.11	0.03	0.02
N	2,920	1,843	294	696	443
Fixed effects for level of randomization	✓	N/A	N/A	N/A	✓

~ p <0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: Dallas ISD, Mastery and uAspire administrative records (for Boston, Lawrence, and Springfield sites).

Notes: Robust standard errors are reported in parentheses. The coefficients report marginal effects from probit regressions. The take-up rates for the text message and peer mentor groups are respectively the sum of the coefficients on text message and control and the sum of the coefficients on peer mentor and control.

Table 9: Student interactions with peer mentors and advisors across the uAspire and Mastery sites

	Interaction with peer mentor or advisor	Interaction with peer mentor	Interaction with advisor	Number of interactions with a peer mentor	Number of interactions with an advisor
uAspire					
Text (N = 1070)	0.229	0.010	0.223	0.012	0.272
Peer mentor (N = 694)	0.544	0.480	0.111	0.718	0.079
Control (N = 1069)	0.048	0.002	0.046	0.002	0.066
Mastery					
Peer mentor (N = 240)	0.563	--	--	0.704	--
Control (N = 203)	0.054	--	--	0.103	--

Source: uAspire and Mastery Charter Schools administrative records (for Boston, Lawrence, and Springfield sites).
Notes: Interaction rates for peer mentors and advisors calculated based on interaction logs that both peer mentors and advisors completed after they interacted with a student. Based on the reporting in the Mastery Charter Schools, we are not able to distinguish between interactions with peer mentors and counselors.

Table 10: Impact of the text message intervention on Fall 2012 enrollment, across intervention sites

	Overall enrollment		Enrollment at a four-year institution		Enrollment at a two-year institution	
	(1)	(2)	(3)	(4)	(5)	(6)
Text message	0.013	0.019	-0.019	-0.018	**0.032****	**0.030***
	(0.013)	(0.013)	(0.014)	(0.016)	**(0.012)**	**(0.012)**
Control group enrollment	0.679	0.696	0.431	0.386	0.233	0.202
N	5753	5753	5753	5753	5753	5753
Pseudo-R^2	0.011	0.116	0.031	0.307	0.042	0.146
Full set of controls		✓		✓		✓
Fixed effects for level of randomization	✓	✓	✓	✓	✓	✓

~ p <0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: Dallas ISD and uAspire administrative records (for Boston, Lawrence, and Springfield sites).

Notes: Robust standard errors are reported in parentheses. Coefficients presented are marginal effects from probit regressions with the covariates set at their means. Controls include gender, race/ethnicity, whether students qualified for free/reduced price lunch, high school GPA (senior year GPA from administrative records in Dallas, self-reported cumulative GPA in uAspire sites), math and ELA state assessment scores (Dallas), whether the student completed the Free Application for Federal Student Aid (uAspire), the number of meetings students had with a uAspire advisor during senior year (uAspire only), the type of institution to which students intended to enroll (uAspire), and whether the student was assigned to a peer mentor intervention implemented concurrently in the uAspire sites (uAspire only). Models include indicator variables for missingness for any covariate with missing values (including missingness because the measure is only recorded for one of the intervention sites).

Table 11: Impact of the peer mentor intervention on Fall 2012 enrollment, across intervention sites

	Overall enrollment		Enrollment at a four-year institution		Enrollment at a two-year institution	
	(1)	(2)	(3)	(4)	(5)	(6)
Peer mentor	0.009	0.023	0.009	**0.045**~	0.001	-0.004
	(0.021)	(0.021)	(0.022)	(0.027)	(0.017)	(0.016)
Control group enrollment	0.657	0.676	0.457	0.388	0.186	0.142
N	3276	3276	3276	3276	3276	3276
Pseudo-R^2	0.013	0.15	0.038	0.406	0.047	0.223
Full set of controls		✓		✓		✓
Fixed effects for level of randomization	✓	✓	✓	✓	✓	✓

~ p <0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: Mastery and uAspire administrative records (for Boston, Lawrence, and Springfield sites).

Notes: Robust standard errors are reported in parentheses. Coefficients presented are marginal effects from probit regressions with the covariates set at their means. Controls include gender, race/ethnicity, whether students qualified for free/reduced price lunch, high school GPA (senior year GPA from administrative records in Mastery, self-reported cumulative GPA in uAspire sites), math and ELA state assessment scores (Mastery), whether the student completed the Free Application for Federal Student Aid (uAspire and Mastery), the number of meetings students had with a uAspire advisor during senior year (uAspire only), the type of institution to which students intended to enroll (uAspire and Mastery), and whether the student was assigned to a peer mentor intervention implemented concurrently in the uAspire sites (uAspire only). Models include indicator variables for missingness for any covariate with missing values (including missingness because the measure is only recorded for one of the intervention sites).

Table 12: Impact of the text message and peer mentor interventions on Fall 2012 enrollment, by intervention site

	Dallas, TX			Boston, MA			Lawrence & Springfield, MA			Philadelphia, PA		
	Overall enroll	Enroll at 4-year	Enroll at 2-year	Overall enroll	Enroll at 4-year	Enroll at 2-year	Overall enroll	Enroll at 4-year	Enroll at 2-year	Overall enroll	Enroll at 4-year	Enroll at 2-year
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Text message	0.024	-0.031	**0.049****	-0.016	-0.021	-0.005	**0.071***	0.042	0.035	--	--	--
	(0.017)	(0.020)	**(0.017)**	(0.026)	(0.032)	(0.014)	**(0.035)**	(0.034)	(0.036)			
Peer mentor	--	--	--	0.035	0.043	-0.001	0.036	0.049	0.008	-0.023	0.019	-0.02
				(0.029)	(0.036)	(0.016)	(0.040)	(0.044)	(0.041)	(0.050)	(0.061)	(0.028)
Control group enrollment	0.718	0.385	0.432	0.701	0.520	0.095	0.628	0.146	0.273	0.675	0.421	0.107
N	2,920	2,920	2,920	1,843	1,843	1,843	990	990	990	443	443	443
Pseudo-R^2	0.10	0.22	0.08	0.16	0.34	0.20	0.13	0.50	0.18	0.222	0.439	0.24
Full set of controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fixed effects for level of randomization	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
p-value on χ^2 test that text message = peer mentor	--	--	--	0.08	0.09	0.86	0.40	0.87	0.51			

~ p <0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: Dallas ISD, Mastery and uAspire administrative records (for Boston, Lawrence, and Springfield sites).

Notes: Robust standard errors are reported in parentheses. Coefficients presented are marginal effects from probit regressions with the covariates set at their means. Controls include gender, race/ethnicity, whether students qualified for free/reduced price lunch, high school GPA (senior year GPA from administrative records in Dallas and Mastery, self-reported cumulative GPA in uAspire sites), math and ELA state assessment scores (Dallas and Mastery), whether the student completed the Free Application for Federal Student Aid (uAspire and Mastery), the number of meetings students had with a uAspire advisor during senior year (uAspire only), the type of institution to which students intended to enroll (uAspire and Mastery), and whether the student was assigned to a peer mentor intervention implemented concurrently in the uAspire sites (uAspire only). Models include indicator variables for missingness for any covariate with missing values (including missingness because the measure is only recorded for one of the intervention sites).

Table 13. Heterogeneous effects of the text message and peer mentor interventions on Fall 2012 enrollment by selected student characteristics, by intervention site

	Pooled sample		Dallas	Boston		Lawrence / Springfield		Philadelphia
	Text	Peer mentor	Text	Text	Peer mentor	Text	Peer mentor	Peer mentor
Free / reduced price lunch	0.022	0.024	**0.041~**	-0.013	0.025	0.004	0.012	0.009
	(0.016)	(0.030)	(0.020)	(0.032)	(0.036)	(0.047)	(0.053)	(0.062)
Non free / reduced price lunch	-.023	0.075	-0.043	-0.058	0.044	0.114	0.063	-0.052
	(0.027)	(0.045)	(0.033)	(0.054)	(0.055)	(0.078)	(0.094)	(0.079)
Male	0.018	**0.072~**	0.028	-0.025	0.019	**0.102~**	**0.138***	-0.088
	(0.021)	**(0.038)**	(0.026)	(0.044)	(0.049)	(0.059)	(0.064)	(0.070)
Female	0.017	0.023	0.027	-0.013	0.042	0.049	-0.02	0.016
	(0.017)	(0.030)	(0.023)	(0.032)	(0.035)	(0.046)	(0.054)	(0.062)
First (bottom) quartile GPA	--	--	0.017	--	--	--	--	**-0.157~**
			(0.027)					(0.092)
Second quartile GPA	--	--	**0.045~**	--	--	--	--	-0.072
			(0.025)					(0.076)
Third quartile GPA	--	--	**0.052~**	--	--	--	--	0.106
			(0.026)					(0.076)
Fourth (top) quartile GPA	--	--	-0.039	--	--	--	--	0.057
			(0.036)					(0.090)
Specified college plans	-0.015	0.000	--	-0.042	-0.007	0.059	0.016	--
	(0.023)	(0.026)		(0.029)	(0.032)	(0.038)	(0.044)	
College plans not specified	**0.071~**	**0.121****	--	0.041	**0.118***	0.113	**0.160~**	--
	(0.041)	**(0.046)**		(0.050)	(0.056)	(0.076)	(0.091)	
Fewer than four advising meetings	**0.034***	**0.051~**	--	0.018	0.044	**0.146****	**0.108~**	--
	(0.015)	**(0.028)**		(0.037)	(0.042)	(0.051)	(0.057)	
Four or more advising meetings	-0.045	-0.004	--	**-0.075***	0.003	-0.017	-0.029	--
	(0.028)	(0.031)		(0.034)	(0.037)	(0.049)	(0.057)	

~ p <0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: Dallas ISD, Mastery and uAspire administrative records (for Boston, Lawrence, and Springfield sites).

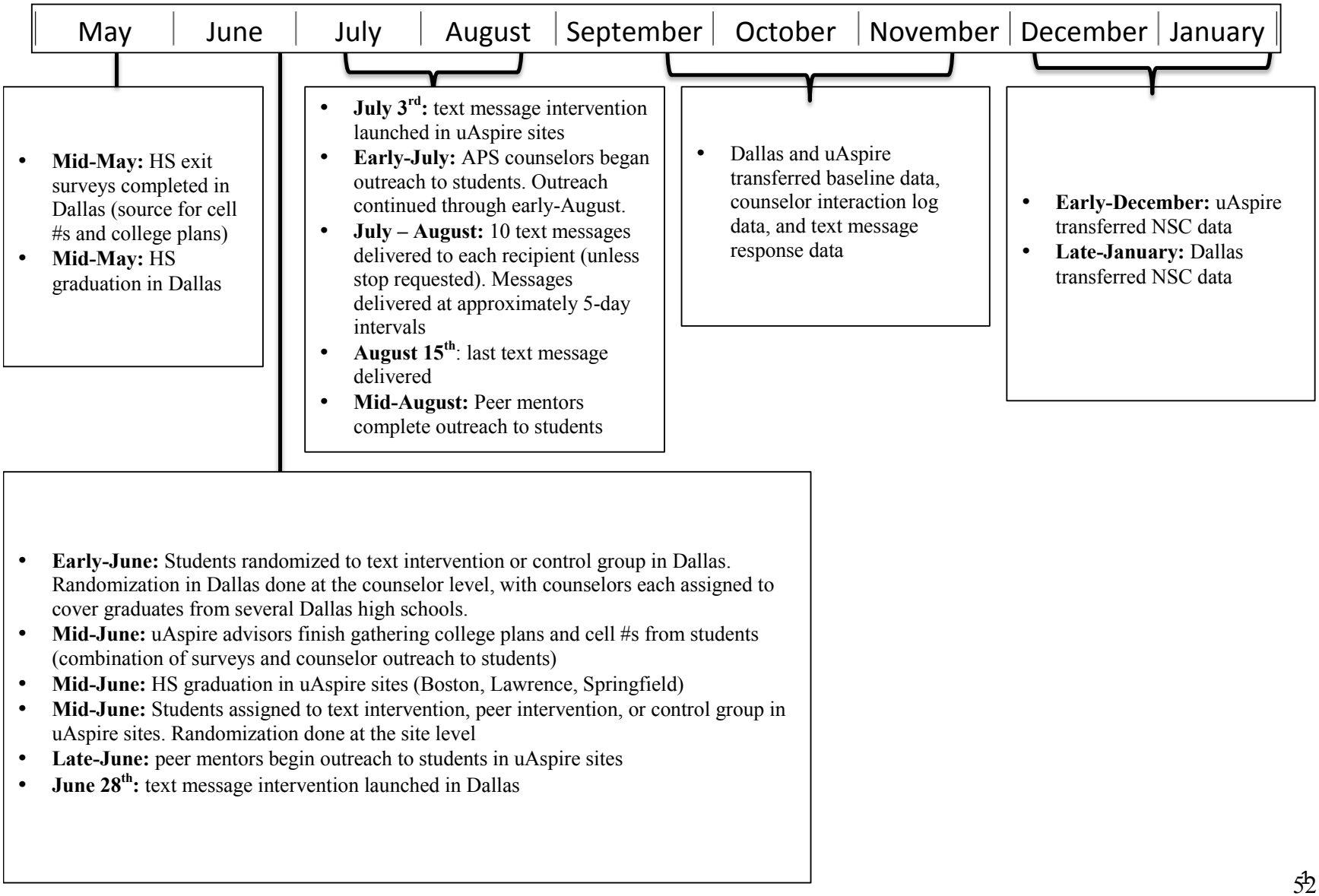
Notes: Robust standard errors are reported in parentheses. Coefficients presented are marginal effects from probit regressions with the covariates set at their means. Controls include gender, race/ethnicity, whether students qualified for free/reduced price lunch, high school GPA (senior year GPA from administrative records in Dallas and Mastery, self-reported cumulative GPA in uAspire sites), math and ELA state assessment scores (Dallas and Mastery), whether the student completed the Free Application for Federal Student Aid (uAspire and Mastery), the number of meetings students had with a uAspire advisor during senior year (uAspire only), the type of institution to which students intended to enroll (uAspire and Mastery), and whether the student was assigned to a peer mentor intervention implemented concurrently in the uAspire sites (uAspire only). Models include indicator variables for missingness for any covariate with missing values (including missingness because the measure is only recorded for one of the intervention sites).

Table 14: Cost estimates and program impacts for the text and peer mentor interventions and several related college-going experimental interventions

Program	Target population	Intervention Design	Cost per participant	First fall semester enrollment impact
Summer 2012 text intervention	College-intending high school graduates	Personalized text reminders of important college tasks	**$7**	3 – 7 percentage points
Summer 2012 peer mentor intervention		Proactive outreach from peer mentors to help with summer tasks	**$80**	4.5 percentage points
Summer 2011 counseling experiment – Boston (Castleman, Page & Schooley, 2012)		Proactive outreach from financial aid advisors to help with summer tasks	**$200**	5 percentage points
Summer 2011 counseling experiment – Fulton County (Castleman, Page & Schooley, 2012)		Proactive outreach from school counselors to help with summer tasks	**$100**	8 percentage points for FRL students
New Hampshire college mentor intervention (Carrell & Sacerdote, 2012)	High school seniors who had not applied to college	1:1 mentoring from college students and application fee waivers	**$500 - $1,000**	12 percentage point increase for females and recent immigrants
H&R Block FAFSA Completion experiment (Bettinger et al., 2012)	Low-income adults with and without children	Help with the FAFSA as part of income tax preparation	**$88**	8 percentage points

Notes: Cost estimates for the New Hampshire college mentor intervention were provided by Bruce Sacerdote. Cost estimates for the California college mentor intervention are from Berman, Ortiz, and Bos (2008). Impact estimates are from a presentation about the program by Johannes Bos at the Fall 2012 APPAM conference. Paper not available on APPAM site.

Figure 1: Text message and high school-university partnership intervention timeline



Appendix A: Intervention Design details for the text message and peer mentor interventions

Text message intervention

Information required for message delivery

To deliver the messages, we relied on three types of information: student and parent cell phone number; the college at which each student intended to enroll; and institution-specific web links and task completion dates corresponding to each message. Each site administered a senior year exit survey to collect students' and parents' contact information, and information on whether and, if so, where students were intending to go to college. Prior to the start of summer, each partner agency provided a list of the colleges at which 80–90 percent of district graduates enroll, based on historic college enrollment data from the National Student Clearinghouse. For each of these colleges, we assembled documents to summarize the summer tasks required of incoming freshmen, along with task-specific web links and completion dates.[32]

Currently, it is not typical for educational agencies such as school districts to communicate with their students or families via text message. For this reason, it bears particular mention that neither students nor their parents were asked to provide informed consent to receive the text messages or to participate in the research study. Both the Dallas ISD and uAspire legal review processes determined that the district/organization could text message students as part of their broader communication and outreach strategies. In collaboration with Dallas ISD and uAspire, we developed several practices so that students would perceive the messages as credible and to minimize costs incurred by students. First, we sent all students an introductory message stating the relevant agency's commitment to helping students make their college plans a reality and letting students know that over the course of the summer they would be sending several text message reminders of important college tasks to complete. The Dallas ISD message was signed by the head of school counseling for the district, while the uAspire message was signed by the student's academic year advisor. Second, we agreed to limit the number of messages we sent to ten.[33] Finally, we developed a system to immediately cancel all future messages if recipients requested that we stop messaging them (we describe this system in greater detail below). Notably, less than four percent of all message recipients requested that we stop messaging them at any point during the summer.

For the purpose of delivering the text messages, we contracted with Reify Health (Reify), a start-up company aimed at improving health and education outcomes through the application of mobile technologies. Each partner agency transferred student and parent contact and student postsecondary plan information directly to Reify, and we provided Reify with spreadsheets containing the college-specific

[32] All of these documents are available upon request.

[33] Our rationale was that cell phone users who do not have unlimited texting plans often pay $0.10 per message. The ten-message limit would therefore limit out-of-pocket expenses to approximately $1.00 per recipient.

task information. Reify then merged the student- and college-level information and delivered personalized messages based on the schedule established at the start of summer.

Peer mentor

Training content

Training covered a number of topics, including the basics of interpreting financial aid award letters and tuition bills, along with other tasks students are commonly required to complete during the summer in order to successfully matriculate in college during the fall. uAspire also spent considerable time providing the mentors with strategies to advise their peers, and facilitated a range of team-building activities to foster collaboration. Throughout the summer, peer mentors had regular meetings with a lead advisor with whom they were paired; peer mentors met individually with their lead advisor and uAspire peer mentors additionally participated in team meetings with other peer mentor-advisor pairs. [34]

Advisor staffing structure

In Lawrence there was one advisor who supported both peer mentors, while in Springfield each of the three peer mentors was paired with a single advisor who provided support throughout the summer. Peer mentors and their lead advisors in Boston were first assigned to one of three teams. The first team had two advisors and four peer mentors; the second team had two advisors and three peer mentors; and the third team had two advisors and three peer mentors. In all three MA sites, the peer mentors worked primarily out of the area uAspire central location. The Mastery peer advisors worked out of one of the five high school campuses. One campus was staffed by two peer mentors and the remaining campuses were staffed by a single peer mentor. In each site, peer mentors were supervised by a campus-designated counselor.

Peer mentor caseload assignments

In Lawrence, the rules were most straightforward: because there were two mentors, one female and one male, both of whom attended four-year institutions, assignment was based exclusively on gender: female students were assigned to the female peer mentor and male students were assigned to the male peer mentor. The assignment rules in Springfield were also fairly straightforward: uAspire assigned students to peer mentors based primarily on gender and the type of institution at which the peer mentor was enrolled. For instance, females who were intending to enroll at a two-year college were assigned to the female peer mentor enrolled at Holyoke Community College. In Boston, the assignment rules were more complex. The first two teams were staffed by advisors who had worked in the High School Advising Program during the academic year. Students were assigned to one of these two teams if they had

[34] Much of the training focus and structure emerged from trainings uAspire conducts for advisors when they join the organization. Additional information about uAspire's approach to training is available upon request from uAspire.

graduated from a high school in which an advisor from that team had worked. This assignment rule accounted for approximately two-thirds of the students in Team 1 and Team 2. The remaining students had worked during senior year with an advisor who either had left uAspire, or who was not assigned to staff the summer peer mentor intervention. These students were assigned to either fill out the first two teams or to populate the third team. Within team, students were assigned wherever possible to specific peer mentors who: (1) attended the college or university where the student intended to matriculate; (2) graduated from the same high school as the student; or (3) was the same gender as the student.

Text message click-through rates

In order to remain within the 160-character limit for text messages, Reify created URL-shorteners, using the Google URL shortener service, for each of the institution- and task-specific web links. These URL-shorteners consolidate a URL of any length into a 20-character web link (e.g. http://goo.gl/7PmVY). Google provides analytic data on the total number of click-throughs for each link, which we present by site in Table A3. Unfortunately, we are unable to distinguish from the available data whether the click-throughs were unique students, or the same student or parent returning multiple times to the site. We pool the uAspire sites because of the overlap in Massachusetts colleges and universities attended by students from all three sites. In the top panel, we provide, for each task for which we sent a web link, the total number of click throughs across all institutions. We also indicate for each task when during the summer the message was delivered. In the bottom panel, we repeat from earlier tables the total number of students assigned to the intervention and the total number of working student and parent numbers that Reify received for each site. We also provide the total number of institutions for which there were institution-specific web links within each site. Across tasks and sites, click-through rates were modest relative to the total number of students and parents to whom Reify was able to send messages. For instance, in Dallas, out of the 814 students and 663 parents messaged, there were 131 click-throughs for the web links that brought recipients to the web portal at the student's intended college. Click through rates in Dallas were lower for messages pertaining to freshman orientation, placement tests, and housing forms (in the clickrange of 38 – 55 click-throughs per task). Towards the end of the summer, there was an increase in click-throughs, with 87 on the tuition payment options links and 47 on the health insurance links. The trend in the uAspire sites was with similar: out of the 768 students and 232 parents messaged, there were 87 click-throughs for the web portal links and a smaller number for the orientation and placement test links (42 and 34, respectively). Click through rates in uAspire were particularly low for the housing form links, which received only 15 click-throughs. As in Dallas, there was an increase towards the end of summer, with 95 click-throughs on the tuition payment options links and 55 on the health insurance links.

Table A1: Intervention staffing by site

	Dallas, TX	Boston, MA	Lawrence, MA	Springfield, MA	Philadelphia, PA
Number of counselors staffing the intervention	9	9	1	3	5
Intervention(s) to which counselors were assigned	Text message and FAFSA completion	Text message (3) Peer mentor (6)	Text message and peer mentor	Text message and peer mentor	Peer mentor
Hours worked per counselor	75	50 - 100	140	140	--
Total student caseload per counselor	260 - 290	Text message – 175 Peer mentor – 75[1]	194[1]	140[1]	40
Text message treatment group students per counselor	150 - 170	175	100	90	--

Notes: Concurrent to the text messaging intervention in Dallas, our research team implemented a FAFSA completion intervention with students who had not completed the FAFSA by high school graduation. The nine Dallas ISD counselors' caseloads therefore included high school seniors who had not completed the FAFSA as of graduation, to whom they were assigned to reach out to help with FAFSA completion, as well as students who had completed the FAFSA and who received the text messaging intervention. Advisors in the uAspire sites were not responsible for active outreach to their caseload of students in the peer mentor intervention. Rather, they were responsible for supporting peer mentors in their outreach to students, and for meeting individually with students when they were referred to the advisor by the peer mentor.

Table A2: Total number of text message web link click-throughs, by site

	Number of web link click-throughs for each task	
	Dallas	uAspire
Task (message delivery time-frame)		
Log on to institutional web portal (early July)	131	87
Register for freshman orientation (early-July)	52	42
Register for placement tests (mid-July)	55	34
Complete housing forms (mid-July)	38	15
Look into tuition payment plan options (late-July)	87	95
Look into health insurance options and waiver policy, if Applicable (early-August)	47	55
Total number of students in text treatment group	1,454	1,070
Total *working* student cell numbers sent to text messaging platform	814	768
Total *working* student cell numbers sent to text messaging platform	663	232
Total number of institutions for which there were institution-specific web links	13	29

Source: Reify Health administrative data

Notes: Reify Health created URL-shorteners, using the Google URL shortener service, for each of the institution- and task-specific web links that were included in the personalized messages that went out to students. Google provides analytic data on the total number of click-throughs for each link. We pool the uAspire sites because of the overlap in Massachusetts colleges and universities attended by students from all three sites.

Table A3: Impact of the text message and peer mentor intervention on Fall 2012 enrollment, Lawrence and Springfield

	Lawrence, MA			Springfield, MA		
	Overall enrollment	Enrollment at four-year	Enrollment at two-year	Overall enrollment	Enrollment at four-year	Enrollment at two-year
	(1)	(2)	(3)	(4)	(5)	(6)
Text message	0.078	0.042	0.056	0.075~	0.031	0.037
	(0.063)	(0.071)	(0.075)	(0.042)	(0.038)	(0.040)
Peer mentor	0.024	0.097	-0.058	0.033	0.018	0.033
	(0.065)	(0.075)	(0.074)	(0.052)	(0.049)	(0.050)
N	294	294	294	696	696	696
Pseudo-R^2	0.16	0.52	0.24	0.16	0.51	0.18
Full set of controls	✓	✓	✓	✓	✓	✓
Fixed effects for level of randomization	N/A	N/A	N/A	N/A	N/A	N/A

~ p <0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: uAspire administrative records (for Boston, Lawrence, and Springfield sites).

Notes: Robust standard errors are reported in parentheses. Coefficients presented are marginal effects from probit regressions with the covariates set at their means. Controls include gender, race/ethnicity, whether students qualified for free/reduced price lunch, self-reported cumulative GPA, whether the student completed the Free Application for Federal Student Aid, the number of meetings students had with a uAspire advisor during senior year, and the type of institution to which students intended to enroll. Models include indicator variables for missingness for any covariate with missing values.

Table A4: Sensitivity of Fall 2012 enrollment impacts to whether students provided a cell number for messaging and whether students' intended institution was covered in the National Student Clearinghouse, Lawrence and Springfield

	Total sample	Student or parent number	No student or parent number	Students intending to enroll at an NSC match inst.
	(5)	(6)	(7)	(8)
Text message	**0.071***	**0.076***	-0.033	**0.071~**
	(0.035)	(0.036)	(0.098)	(0.038)
Peer mentor	0.036	0.048	0.104	0.033
	(0.040)	(0.040)	(0.217)	(0.043)
N	990	938	52	723
Full set of controls	✓	✓	✓	✓
Fixed effects for level of randomization	✓	✓	✓	✓

~ p <0.10, * p<0.05, ** p<0.01, *** p<0.001

Source: uAspire administrative records (for Boston, Lawrence, and Springfield sites).

Notes: Robust standard errors are reported in parentheses. Coefficients presented are marginal effects from probit regressions with the covariates set at their means. Controls include gender, race/ethnicity, whether students qualified for free/reduced price lunch, cumulative GPA (student self-reported for uAspire), whether the student completed the Free Application for Federal Student, and the number of meetings students had with a uAspire advisor during senior year. Models include indicator variables for missingness for any covariate with missing values.