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Statistical Analysis Report

NCES 2016-405

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Executive Summary

Every year, millions of new college students arrive on campus lacking the necessary academic skills to perform at the college level. Postsecondary institutions address this problem with extensive remedial programs designed to strengthen students' basic skills. In 2011−12, about one-third of all first- and second-year bachelor's degree students—29 percent of those at public 4-year institutions and 41 percent of those at public 2-year institutions—reported having ever taken remedial courses (Skomsvold 2014). Remedial coursetaking rates could be higher if estimates were based on transcript data (Radford and Horn 2012) or if colleges made remedial education mandatory for all students assessed as academically underprepared for college-level work (Bailey and Cho 2010).

Despite the prevalence of remedial programs in our nation's colleges, considerable uncertainty remains concerning their short- and long-term efficacy (Kurlaender and Howell 2012). While much research on the effectiveness of remedial education has been conducted, rigorous studies are limited and the results have been mixed. This Statistical Analysis Report attempts to contribute to the literature with a descriptive analysis of beginning postsecondary students' coursetaking spanning the 6-year period between 2003 and 2009, documenting the scope, intensity, timing, and completion of remedial coursetaking and its association with various postsecondary outcomes among students who began at public 2- and 4-year institutions. Remedial education programs may include support services in addition to precollege-level coursework, both of which are designed to get underprepared students ready for college-level work. However, this report focuses only on remedial coursework (not support services), using the terms *remedial coursetaking, college remediation,* or simply *remediation* interchangeably to describe students' participation in college preparatory coursework at the postsecondary level. The study addresses the following questions:

- What percentage of 2003−04 beginning postsecondary students at public 2- and 4-year institutions took remedial courses from 2003 to 2009? What types of remedial courses did they take? What was the average number of remedial courses taken?

- Who took remedial courses? When did students take these courses? What were their completion rates?

- Did remedial course completers and noncompleters experience different postsecondary outcomes than students who had similar demographic backgrounds, academic preparation, and enrollment characteristics but did not take any remedial courses?

The data for this report were drawn from the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and its associated 2009 Postsecondary Education Transcript Study (PETS:09). BPS:04/09 followed a nationally representative sample of students who began their postsecondary education in 2003−04 for a total of 6 years, through 2009. For simplicity and ease of discussion, this report refers to students as *remedial students* if they took at least one remedial course during these 6 years according to their postsecondary transcripts and as *nonremedial students* if they did not take a remedial course. It is important to note that this study only examined students' participation in remedial coursework; it addresses neither students' need for nor placement in remedial courses due to the unavailability of data in BPS:04/09. Thus, nonremedial students in this report may include some students who were underprepared for college-level work when they began their postsecondary education.

This study identified remedial courses based on PETS codes derived from the 2010 Classification of Instructional Programs (CIP) developed by the U.S. Department of Education's National Center for Education Statistics (NCES) (Wine, Janson, and Wheeless 2011). Remedial courses are generally associated with such terms as *developmental, remedial, precollegiate,* and *basic skills* in the course name and/or content description. For a more detailed discussion about how remedial courses are identified in students' transcripts, see the section on *Key Terms* in the main text. A detailed classification of remedial courses used in this study is provided in appendix D.

Analyses were performed separately for students beginning at public 2-year institutions and those beginning at public 4-year institutions due to differences in the remedial policies, scope and intensity of remediation, and preparation of incoming students at these two types of institutions. Much of the analyses also separated remedial English/reading coursetaking from remedial math coursetaking due to different remediation rates in these two areas (Radford and Horn 2012). Key findings are summarized below.

Remedial Coursetaking: Scope, Intensity, Timing, and Completion Rates at Public 2- and 4-Year Institutions

Participation in remedial coursework is widespread in the U.S. public higher education system (Radford and Horn 2012). Among 2003−04 beginning postsecondary students, 68 percent of those starting at public 2-year institutions and 40 percent of those

starting at public 4-year institutions took at least one remedial course during their enrollment between 2003 and 2009, according to their transcripts (table 1).

The intensity of remediation was particularly apparent at public 2-year institutions: almost one-half of their incoming students (vs. 21 percent of those at public 4-year institutions) took two or more remedial courses, and 26 percent (vs. 9 percent at public 4-year institutions) took remedial courses across multiple subjects. On average, remedial students at public 2-year institutions took about three remedial courses (vs. two courses at public 4-year institutions).

Not all students who enrolled in remedial courses passed them. About half of remedial coursetakers beginning at public 2-year institutions (49 percent) completed all the remedial courses they attempted (referred to as *remedial completers* in this report) (table 3). The remedial completion rate among those beginning at public 4-year institutions was somewhat higher at 59 percent. Overall, 16 percent of remedial coursetakers beginning at public 2-year institutions and 15 percent of those beginning at public 4-year institutions did not complete any of the remedial courses they attempted (*remedial noncompleters*). The remaining students, about 35 percent of remedial coursetakers beginning at public 2-year institutions and 25 percent of those beginning at public 4-year institutions, completed some but not all of their remedial courses (*partial remedial completers*).

Characteristics of Remedial Coursetakers

Because remedial courses are designed to strengthen academic skills, remediation was highly concentrated among students with limited academic preparation.[1] Among those beginning at public 2-year institutions, 75 percent of weakly prepared students, compared with 48 percent of strongly prepared students, took remedial courses during their college years (figure 1). Among those beginning at public 4-year institutions, the remediation rate for weakly prepared students was more than four times that for strongly prepared students (77 percent vs. 18 percent). Nevertheless, some weakly prepared students did not take any remedial courses (25 percent at public 2-year institutions and 23 percent at 4-year institutions), while some strongly

[1] In this report, students' academic preparation is a composite measure derived from three precollege academic indicators: high school grade point average (GPA), highest mathematics course taken in high school, and college admission test (ACT or SAT) scores. BPS:04/09 did not collect data on these three measures for students age 24 or older; therefore, information on the academic preparation composite measure is only available for students under age 24. To prevent sample loss, students age 24 or older (about 13 percent of the study sample) were grouped into an "unknown" category in the academic preparation composite measure and retained in all analyses conducted for this report. Discussion of the results on students' precollege academic preparation, however, was only pertinent to students under age 24. See appendix A for a detailed construction of this composite measure.

prepared students took one or more remedial courses (48 percent at public 2-year institutions and 18 percent at public 4-year institutions). These findings may reflect misalignment between high school and college academic standards and varying policies on remedial education and placement across states and institutions (Dillon and Smith 2013; Hughes and Scott-Clayton 2011; Kurlaender and Howell 2012).

Participation in remediation was more common among several demographic groups, including Blacks and Hispanics[2] (at both types of institutions), students from low-income backgrounds[3] (at both types of institutions), first-generation students[4] (at public 4-year institutions), and female students (at public 2-year institutions) (table 2). Regardless of these subgroup differences, college remediation overall was widespread, affecting both disadvantaged and advantaged populations. For example, among students who began at public 2-year institutions and came from high-income or college-educated families, a majority participated in remedial education (59 percent and 65 percent, respectively). Among students who began at 4-year institutions, about a third of students in these groups (33 percent and 31 percent, respectively) participated in remedial education. In addition, nearly 30 percent of students who entered highly selective 4-year institutions took one or more remedial courses during their undergraduate career.

Postsecondary Outcomes of Remedial Coursetakers

This study began by examining the bivariate relationships between remedial enrollment/completion status and various postsecondary outcomes, including whether students enrolled and earned credits in college-level English and math courses; whether students persisted through college; whether public 2-year students subsequently transferred to a 4-year institution; how many college-level credits students earned; and whether students attained a postsecondary credential, especially a bachelor's degree, by the sixth year after their initial college entry. The study then examined the net association between remedial course enrollment/completion and these outcomes, controlling for many preexisting factors that may be associated with remedial placement, completion, and subsequent postsecondary outcomes. The main findings are highlighted below.

- **Remedial completion is associated with positive postsecondary outcomes**. Bivariate results showed that remedial completers experienced

[2] Black includes African American. Hispanic includes Latino. All race categories exclude Hispanic or Latino origin.
[3] Low- or high-income refers to an income in the lowest or highest quarter of the income distribution, respectively.
[4] First-generation students are defined as students whose parents did not attend college.

better postsecondary outcomes than did partial remedial completers and noncompleters in terms of attaining various postsecondary outcomes, e.g., earning college-level English and math credits (tables 4 and 5), transferring to a 4-year institution (table 6), persisting through college (figure 5), accumulating college-level credits (table 7), and attaining a bachelor's degree (figure 7). In addition, remedial completers did as well as or even better than those who did not take any remedial courses in such areas as earning college-level English credits (table 4), transferring to a 4-year institution (table 6), and persisting through college (figure 5). Overall, remedial noncompleters experienced the worst outcomes, while partial completers showed mixed results.

- **Not all remedial completers experienced favorable outcomes once various demographic, academic, enrollment, and contextual characteristics were controlled for in the multivariate analysis**.[5] As summarized in table A, the positive associations between remedial completion and various outcomes were apparent among weakly prepared students but not among moderately or strongly prepared students. For example, after controlling for related characteristics, remedial math completers with weak academic preparation surpassed their counterparts[6] without math remediation in many areas: they had a higher probability of earning college-level math credits (21 and 19 percentage points higher among students beginning at public 2- and 4-year institutions, respectively) (table 10), had a lower probability of dropping out of college during the first 2 years in college (11 percentage points lower among students beginning at public 4-year institutions) (table 11), and earned more college-level credits through 2009 (students beginning at public 2- and 4-year institutions earned 18 and 24 more credits, respectively (table 13). For students beginning at public 4-year institutions, remedial English/reading completers with weak academic preparation had a higher probability of earning college-level English credits (10 percentage points higher) (table 9) than their counterparts without English/reading remediation, and remedial completers with weak preparation had a higher probability of earning a bachelor's degree

[5] Characteristics included in the multivariate regressions are sex; race/ethnicity; parental education; income level; precollege academic preparation; initial educational expectations; initial enrollment intensity; academic integration in the first year; and the size, minority concentration, and region of the institution that students first attended. For students who began in public 4-year institutions, the regression models also included the selectivity of the first institution. For the analysis on the outcome of public 2-year students transferring to a 4-year institution, the regression model also included students' initial transfer plan. Many of these characteristics have been identified in the literature as potentially important to remedial placement, completion, and eventual success in college.

[6] In this sentence and throughout the remainder of the report, *counterparts* refers to students whose other characteristics were controlled statistically—effectively made the same with regard to the control variables—with the exception of their remedial coursetaking status.

(21 percentage points higher) (table 14) than their counterparts who did not take any remedial courses. None of these positive outcomes, however, was observed for remedial completers with moderate or strong preparation when compared with their counterparts who had similar demographic and enrollment characteristics and academic preparation but did not take remedial courses (table A). That is, there was no apparent advantage for remedial completers with moderate to strong preparation who began at 2- or 4-year institutions in terms of acquiring math or English credits or total college credits, persisting in college, or earning a bachelor's degree 6 years later when compared with nonremedial students who had similar demographic and enrollment characteristics and academic preparation.

- **The outcomes of partial remedial completers also varied with their precollege academic preparation**. As shown in table A, partial remedial completers with weak academic preparation performed at least as well as their nonremedial counterparts in all areas except for bachelor's degree attainment.[7] When looking at the moderately/strongly prepared group, the pattern was different: partial remedial completers fared worse than their nonremedial counterparts in many areas. For instance, at public 2-year institutions, partial remedial completers with moderate or strong preparation had lower probabilities of earning college-level English credits than their nonremedial counterparts did (30 percentage points lower) (table 9). At both public 2- and 4-year institutions, partial remedial completers with moderate or strong preparation had lower probabilities of earning college-level math credits than their nonremedial counterparts (28 and 16 percentage points lower, respectively) (table 10). Those starting at public 2-year institutions also had lower probabilities of transferring to a 4-year institution than their nonremedial counterparts (13–19 percentage points lower depending on the transfer measure used) (table 12). Gaps were further observed for the number of college-level credits earned through 2009: partial remedial English/reading completers with moderate or strong preparation earned fewer college-level credits through 2009 than their nonremedial counterparts (26 and 34 fewer credits at public 2- and 4-year institutions, respectively) (table 13). Finally, partial remedial completers with moderate or strong preparation had lower probabilities of earning a bachelor's degree within 6 years after entering college than their nonremedial counterparts did (10–21 percentage points lower depending on the comparison group) (table 14).

[7] The exception was at public 2-year institutions, where partial remedial math completers with weak academic preparation had a lower probability of attaining a bachelor's degree than their counterparts without math remediation (table 14).

Table A.
Summary of multivariate results

Selected outcomes and comparison groups[1]	Students beginning at public 2-year institutions: Weak academic preparation	Students beginning at public 2-year institutions: Moderate/ strong academic preparation	Students beginning at public 4-year institutions: Weak academic preparation	Students beginning at public 4-year institutions: Moderate/ strong academic preparation
Earned college-level English credits				
Remedial English/reading completers vs. counterparts	ns	ns	+	ns
Partial remedial English/reading completers vs. counterparts	ns	-	ns	ns
Remedial English/reading noncompleters vs. counterparts	-	-	-	ns
Earned college-level math credits				
Remedial math completers vs. counterparts	+	ns	+	-
Partial remedial math completers vs. counterparts	ns	-	ns	-
Remedial math noncompleters vs. counterparts	-	-	-	-
Left college without a degree/certificate in first 2 years				
Remedial English/reading completers vs. counterparts	ns	ns	ns	ns
Partial remedial English/reading completers vs. counterparts	ns	ns	ns	ns
Remedial English/reading noncompleters vs. counterparts	ns	ns	ns	ns
Remedial math completers vs. counterparts	ns	ns	-	ns
Partial remedial math completers vs. counterparts	-	ns	-	ns
Remedial math noncompleters vs. counterparts	ns	+	+	+
Transferred to a 4-year Institution				
Remedial English/reading completers vs. counterparts	ns	-	†	†
Partial remedial English/reading completers vs. counterparts	ns	-	†	†
Remedial English/reading noncompleters vs. counterparts	-	-	†	†
Remedial math completers vs. counterparts	ns	ns	†	†
Partial remedial math completers vs. counterparts	ns	-	†	†
Remedial math noncompleters vs. counterparts	-	-	†	†
Number of college-level credits earned as of 2009				
Remedial English/reading completers vs. counterparts	ns	ns	ns	ns
Partial remedial English/reading completers vs. counterparts	ns	-	ns	-
Remedial English/reading noncompleters vs. counterparts	-	-	ns	ns
Remedial math completers vs. counterparts	+	ns	+	ns
Partial remedial math completers vs. counterparts	ns	ns	ns	ns
Remedial math noncompleters vs. counterparts	-	-	ns	-
Attained a bachelor's degree by 2009				
Remedial English/reading completers vs. counterparts	ns	ns	†	†
Partial remedial English/reading completers vs. counterparts	ns	-	†	†
Remedial English/reading noncompleters vs. counterparts	ns	ns	†	†
Remedial math completers vs. counterparts	ns	ns	†	†
Partial remedial math completers vs. counterparts	-	-	†	†
Remedial math noncompleters vs. counterparts	-	-	†	†
Remedial completers vs. counterparts	†	†	+	-
Partial remedial completers vs. counterparts	†	†	ns	-
Remedial noncompleters vs. counterparts	†	†	ns	-

† Not applicable

[1] Each row represents the comparison between one particular remedial group of students and their nonremedial counterparts (e.g., remedial math completers and their counterparts without math remediation) in attaining an outcome after controlling for various characteristics. The symbol "ns" indicates the group difference is not significant; "+" indicates the group difference is significant with the remedial group surpassing their nonremedial counterparts; "-" indicates that the group difference is significant with the remedial group being surpassed by their nonremedial counterparts.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

- **Remedial noncompleters lagged behind their nonremedial counterparts for most of the outcomes examined, but those with moderate or strong preparation lagged even further behind when compared with their nonremedial counterparts with similar demographic and enrollment characteristics and academic preparation**. For example, while remedial math noncompleters at public 2-year institutions generally had a lower probability of earning college-level math credits than their counterparts without math remediation, the gap appeared to be wider among the moderately/strongly prepared group (47 percentage points lower) than the weakly prepared group (23 percentage points lower) (table 10). Similarly, remedial math noncompleters at public 2-year institutions generally earned fewer college-level credits than nonremedial math students, but the difference tended to be greater among the moderately/strongly prepared (27 credits fewer) than among the weakly prepared (18 credits fewer) (table 13). At public 4-year institutions, while remedial noncompleters with weak preparation did not differ measurably from their nonremedial counterparts in their probabilities of earning a bachelor's degree 6 years after college entry, remedial noncompleters with moderate/strong preparation had a lower probability of earning a bachelor's degree (28 percentage points lower) than their nonremedial counterparts did (table 14).

In sum, the relationship between students' participation in and completion of remedial coursework and their subsequent college outcomes varied by their level of academic preparedness. Weakly prepared students who successfully completed all remedial courses (English/reading or math) experienced better postsecondary outcomes than did their counterparts who were weakly prepared but did not enroll in remedial courses. Similar patterns, however, did not hold for remedial completers with moderate/strong preparation when compared with their counterparts (i.e., students who had similar demographic and enrollment characteristics and academic preparation) who did not enroll in remedial courses. In almost all comparisons, remedial completers with moderate/strong preparation did not demonstrate significantly better or worse outcomes than their nonremedial counterparts when academic preparation and background characteristics were taken into account.

Students who enrolled in but failed to complete remedial courses experienced worse outcomes than did their counterparts who had similar backgrounds but did not take remedial courses. Holding students' demographic and enrollment characteristics constant, remedial noncompleters, especially those with moderate/strong preparation, were less likely to move on to college-level courses, persist through college, transfer to a 4-year institution, earn sufficient numbers of credits toward

graduation, and attain a bachelor's degree within 6 years than did their counterparts who did not take remedial courses.

Given the different outcomes experienced by remedial completers and noncompleters, further research is needed to identify the underlying obstacles that hinder remedial course completion. Understanding the major obstacles can help colleges and universities better identify struggling students, design strategies to help them overcome their hurdles, and make remedial programs more effective in retaining students and enabling them to progress to college-level curricula and beyond.

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Introduction

Every year, a sizeable percentage of new college students arrive on campus without the academic skills necessary for college-level work. For example, using transcript data and reading assessment scores from the National Assessment of Educational Progress (NAEP), Greene and Winters (2005) found that two-thirds of public school students in the 2002 high school graduating class were not college ready. Colleges and universities address this problem with extensive remedial programs designed to make up for students' weak preparation (Parsad and Lewis 2003). In 2011−12, about 29 percent of first- and second-year students enrolled in public 4-year institutions reported having taken remedial coursework after high school graduation, as did 41 percent of first- and second-year students at public 2-year institutions (Skomsvold 2014). Remediation rates could be higher if estimates were based on transcript data (Radford and Horn 2012) or if remediation were a mandated prerequisite to college-level work (Bailey and Cho 2010).[8]

Postsecondary remediation has been a subject of ongoing debate among policymakers and educators for a long time (Martorell and McFarlin 2010). Supporters argue that remedial courses and services expand educational opportunities for underprepared students, giving them a chance to gain the competencies necessary for college success and gainful employment. Opponents contend that remedial education is costly and that colleges should not pay for academic preparation that students should have received in secondary schools (Bahr 2008). Critics add that remedial coursetaking increases the requirements that students need to fulfill before taking college-level courses, thereby prolonging time to degree and potentially hindering transfer and completion (Bettinger and Long 2005).

Despite the investment in remedial programs and the large proportion of U.S. postsecondary students participating in them, there is considerable uncertainty surrounding their short- and long-term effects (Kurlaender and Howell 2012). While research on the effectiveness of remedial education abounds, rigorous studies are limited, and the results are often mixed. This Statistical Analysis Report attempts to contribute to the literature by using nationally representative data from the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and its associated 2009 Postsecondary Education Transcript Study (PETS:09) to examine a

[8] Bailey and Cho (2010) found that many students who were referred to remedial courses did not actually show up for these classes.

range of short- and long-term postsecondary outcomes associated with remedial coursetaking among students beginning at public 2- and 4-year institutions. Capitalizing on the transcript data collected through BPS:04/09, this study provided transcript-based estimates of remedial course enrollment among various student subgroups. These estimates were based on coursetaking records from transcripts collected from all the postsecondary institutions that respondents of BPS:04/09 attended from 2003 to 2009.

To provide a context for this analysis, the following sections review the research literature on college remediation, describe the purpose of this study and its research questions, discuss data sources and samples used for the analysis, and address some limitations of this study.

Literature Review

Remedial education (also developmental education or college remediation)[9] describes precollege-level courses and support services provided by postsecondary institutions to help academically underprepared students succeed in college-level courses (Institute for Higher Education Policy 1998). This report narrows this broad definition, referring to remedial education specifically as courses that are offered by postsecondary institutions but that cover curricular content below the college level.[10] Most remedial courses are designed to address entering postsecondary students' low-level skills in English/reading and math (Kurlaender and Howell 2012). Remedial English/reading courses focus on advancing students' literacy (reading and writing) skills, whereas remedial math courses are typically designed to prepare students for first-level college math courses (Hughes and Scott-Clayton 2011).

The concept of college remediation is simple: students who arrive on campus unready for college-level work are provided with assistance to bring them up to an adequate level of academic proficiency. In practice, however, remedial education is complicated: the system is characterized by high costs with largely unknown benefits, lack of consensus about the definition of college readiness, and varying policies and implementing strategies across states and institutions (Bailey 2009; Bettinger, Boatman, and Long 2013; Kurlaender and Howell 2012). Because remedial courses cover precollege materials, the credits that students earn in these courses are usually not counted toward graduation requirements. Consequently, remedial students often need more time than nonremedial students to earn a credential (Lewis and Farris 1996).

[9] These terms are used interchangeably in the literature.
[10] This study did not address remedial services such as tutoring, counseling, and mentoring.

Policy Context for Remedial Education

With an estimated annual cost of over $2 billion[11] (Strong American Schools 2008), the debate about the investment in college remediation has intensified in recent years. As budgets become more constrained, many states question whether and how remediation should be offered and have implemented or are considering policies that would limit remedial services at postsecondary institutions (Bettinger and Long 2007; Merisotis and Phipps 2000). Some states (e.g., Arkansas, California, Louisiana, Massachusetts, New York, Oklahoma, Tennessee, and Virginia) have reduced the number of remedial course offerings. Others have attempted to shift the primary responsibility for remediation to community colleges (e.g., Illinois, Montana, Tennessee, and Texas). Several states have implemented drastic measures to change remedial education. For example, Georgia recently adopted a policy requiring that all prospective students who do not have SAT/ACT scores take a placement test and be denied admission if they do not pass the minimum requirements for college-level courses.[12] Ohio passed legislation that would pull state subsidies from all remedial courses in state universities beginning in 2014.[13] In 2013, Florida approved legislation that gives community college students the choice of skipping remediation, even when college advisers or placement tests say they need it (Fain 2013). Finally, in 2012, Connecticut's General Assembly passed historic legislation that prohibits state community colleges from offering more than one semester of remedial instruction to students (Inside Higher Ed 2012).

The high cost of remediation has also spurred debates among researchers about how to determine students' college readiness and place them into appropriate coursework (Bailey, Jeong, and Cho 2010; Hassel and Giordano 2015; Hughes and Scott-Clayton 2011). Thus far, however, there is no consensus definition for college readiness, direct measures of readiness are not available, and remedial and placement policies often vary across institutions and states (Bettinger and Long 2005; National Center on Education and the Economy 2013; Roderick, Nagaoka, and Coca 2009).

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[11] National data regarding the costs of college remediation are limited. A widely cited early study estimated that U.S. postsecondary institutions spent about $1−2 billion annually on remedial education (Breneman and Haarlow 1998). Another study suggested that the annual cost of remediation was between $1.9 and $2.3 billion at community colleges and about 500 million dollars at 4-year colleges (Strong American Schools 2008). A more recent study estimated that the cost of remediation at community college alone could be as high as $4 billion per year (Scott-Clayton and Rodriguez 2012).

[12] University System of Georgia. (n.d.). *Freshmen Requirements*. Retrieved August 1, 2014, from http://www.usg.edu/academic_affairs_handbook/section3/C660.

[13] Ohio Laws and Rules (n.d.). Retrieved August 1, 2014, from http://codes.ohio.gov/orc/3345.061v1.

Despite these current efforts to limit remedial education in colleges and concerns about defining college readiness and remedial placement, its supporters continue to view it as an essential component of higher education. For example, philanthropists have demonstrated a growing interest in efforts to strengthen the weak academic skills of college students (Bailey and Cho 2010). Private foundations, such as the Lumina Foundation for Education, the Bill & Melinda Gates Foundation, and the Carnegie Foundation for the Advancement of Teaching, have launched and funded various initiatives designed to improve remedial education and increase completion rates of students with weak academic skills. Many colleges across the country are trying new, customized approaches to shortening the time needed for remedial education, thereby helping students move into college-level courses more quickly (Government Accountability Office 2013; Rutschow and Schneider 2011). Additionally, in 2010, President Obama signed the *Student Aid and Fiscal Responsibility Act*, providing resources to community colleges to meet the needs of students who are likely to require remediation.[14]

Trends in College Remediation

Based on students' self-reports in 2011−12, one-third of first- and second-year undergraduates overall—29 percent of those in public 4-year institutions and 41 percent of those in public 2-year institutions—had ever participated in remedial coursetaking (Skomsvold 2014). Remediation rates estimated from students' transcript data, however, are much higher. According to a transcript-based study, 50 percent of first-time 2003−04 beginning postsecondary students—39 percent of those entering public 4-year institutions and 68 percent of those entering public 2-year institutions—took at least one remedial course during their undergraduate career (Radford and Horn 2012). The remediation rate also varied by the selectivity of the institution that students first attended, ranging from 58 percent in open-admission 4-year institutions to 51 percent in minimally selective 4-year institutions to 37 percent in moderately selective 4-year institutions to 22 percent in highly selective 4-year institutions (Radford and Horn 2012). The rate could be even higher if remediation becomes a required prerequisite to college-level work.[15] In the California State University system, for instance, all entering students who do not

[14] National Association for College Admission Counseling. (n.d.). *Student Aid and Fiscal Responsibility Act (SAFRA)*. Retrieved August 1, 2014, from http://www.nacacnet.org/issues-action/LegislativeNews/Pages/SAFRA.aspx.

[15] Research has found that many students with remedial needs did not enter remediation. Reasons ranged from confusion about the remedial process and concerns about the cost and time to degree to fear of negative stigmas attached to remediation (Bailey and Cho 2010; Deil-Amen and Rosenbaum 2002; Institute for Higher Education Policy 1998; Rosenbaum, Deil-Amen, and Person 2009).

meet proficiency thresholds are required to enroll in basic skill courses, and the remediation rate is close to 80 percent (Kurlaender and Howell 2012).

Trend analyses indicate that college remediation has declined somewhat over time. Using transcript data, Adelman (2004) found that the percentage of high school students who took remedial courses after entering 4-year institutions decreased from 44 percent in the class of 1982 to 25 percent in the class of 1992, and the percentage among those entering 2-year institutions changed from 63 percent to 61 percent in these cohorts. A downward trend was also reported in a more recent study examining changes in self-reported remedial enrollment rates from 1999–2000 to 2007–08: proportionally fewer first-year students reported taking remedial courses in 2007–08 than in 1999–2000 (21 percent in public 4-year institutions and 24 percent in public 2-year institutions in 2007–08, compared with 25 percent and 30 percent, respectively, in 1999–2000) (Sparks and Malkus 2013). It is unknown whether this decline is a result of an improvement in college readiness, a policy shift away from remediation, increasing numbers of students who deliberately avoid non-credit-bearing remedial courses due to increasing college costs, or the possible inaccuracy of self-reported data on remediation.

Characteristics of Remedial Coursetakers

Because remedial courses are designed to strengthen academic skills, it is not surprising that the majority of incoming college students with limited academic preparation take such courses. Depending on which academic preparation measure is used, the percentage of college freshmen taking remedial courses over their college careers ranges from 62 percent among those with a high school grade point average (GPA) below 2.5 to 68 percent among those who took no math beyond algebra to 74 percent among those with a combined verbal and math college admission test score (SAT) below 701 out of the full score of 1,600 (Radford and Horn 2012).

Remediation is also high among students enrolling in 2-year or less selective 4-year institutions, where admission policies are open or relatively less restrictive. In addition, higher proportions of Black and Hispanic students, first-generation students (i.e., students whose parents did not attend college), and those from low-income backgrounds participate in remedial education than do their peers (Adelman 2004; Attewell et al. 2006; Radford and Horn 2012; Snyder and Dillow 2012).

Effects of College Remediation

Although research on remedial education is abundant, especially since the 1970s, knowledge about its effectiveness is equivocal at best (Bailey 2009; Bettinger,

Boatman, and Long 2013; Kurlaender and Howell 2012; Levin and Calcagno 2008). Early research mainly focused on simple comparisons between remedial and nonremedial students. While these analyses were useful in providing context, they rarely provided deep understanding of the complex relationships between remediation and postsecondary outcomes. Assessing the impact of remediation is difficult because remedial students possess many characteristics that are associated with both their need for remediation and their likelihood of success in college. With these characteristics, remedial students are likely to do worse than nonremedial students in the absence of intervention. An informative assessment of the impact of remediation on postsecondary outcomes requires a comparison group that is as similar as possible to remedial students on preexisting characteristics and conditions, thus controlling against possible selection biases.

In recent years, research has begun to employ more rigorous methods[16] to address these methodological challenges. The results have been mixed. While some studies did not find significant impacts of remediation on retention, transfer, and degree completion (e.g., Calcagno and Long 2008; Martorell and McFarlin 2010; Scott-Clayton and Rodriguez 2012), others revealed that remedial coursetaking improved students' chances of completing college-level courses, persisting in college, and attaining a degree, with the effects particularly evident for students who successfully completed remedial courses (Attewell et al. 2006; Bahr 2008, 2010; Bettinger and Long 2005; Lesik 2006). Evidence also suggests that the effects of remedial coursework may vary by the level of prior academic preparation, with remediation potentially benefiting severely unprepared students more than others (Boatman and Long 2010). Despite these findings, the research community lacks a substantial knowledge base about the effectiveness of remedial education. Studies tend to be small and typically focus on one state or a single college. Some of the most rigorous studies are confined to students on the margins of needing remedial courses, precluding the generalizability of their findings to other populations and contexts. Furthermore, many studies do not track students over an extended period of time, precluding analyses of long-term outcomes (Bettinger, Boatman, and Long 2013; Kurlaender and Howell 2012).

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[16] For example, one innovative approach employs a "regression discontinuity" method, comparing the outcomes of students whose college placement test scores fall just below and above the cutoff point for remedial placement (Boatman and Long 2010; Calcagno and Long 2008; Martorell and McFarlin 2010; Scott-Clayton and Rodriguez 2012). The assumption is that those who just barely fail the test and therefore are placed into remediation are not inherently different from those who just barely exceed the cutoff and are not placed into remediation. The comparison of these two groups, then, would yield unbiased estimates of the impact of remediation on students at the margin of needing remedial help. It is worth noting that many of these studies (Boatman and Long 2010 being a notable exception) included only the upper tail of the distribution of remedial students in their analyses.

Study Questions, Key Terms, and Organization of the Report

Study Questions

This study used nationally representative data from BPS:04/09 and its associated transcript study (PETS:09) to examine the scope, timing, and completion of remedial coursetaking and its association with various postsecondary outcomes among students who began their postsecondary education at public 2- and 4-year institutions across the United States. The study addressed these issues through the following questions:

- What percentage of 2003−04 beginning postsecondary students at public 2- and 4-year institutions took remedial courses from 2003 to 2009? What types of remedial courses did they take? What was the average number of remedial courses taken?
- Who took remedial courses? When did students take these courses? What were their completion rates?
- Did remedial course completers and noncompleters experience different postsecondary outcomes than students who had similar demographic backgrounds, academic preparation, and enrollment characteristics but did not take any remedial courses?

This study focused on public 2- and 4-year institutions for several reasons.[17] The vast majority of remedial coursetakers are concentrated at public 2- and 4-year institutions;[18] recent policy concerns about college remediation generally target public institutions, especially public 2-year community colleges (Complete College America 2012); and the samples of remedial coursetakers at various types of private institutions in BPS:04/09 are too small to support a reliable analysis. Due to differences in the remedial policies, scope, and intensity of remediation, and preparation of incoming students at public 2- and 4-year institutions, this study separated analyses for students beginning at public 2-year institutions and those beginning at public 4-year institutions. Much of the analysis also separated remedial English/reading coursetaking from remedial math coursetaking due to different remediation rates in these two areas (Radford and Horn 2012).

[17] About 1 percent of students in BPS:04/09 started their postsecondary education at public less-than-2-year institutions. These students were not included in this report due to the sample size.
[18] According to BPS:04/09, about 80 percent of all remedial coursetakers started their postsecondary education at public 2-year institutions (59 percent) or public 4-year institutions (21 percent).

Key Terms

Remedial Courses. This study identified remedial courses using the codes developed for PETS:09 by the National Center for Education Statistics (NCES). BPS:04/09's PETS:09 collected information on all courses (e.g., course titles, credits, grades) that students attempted in all institutions that they had attended from 2003 to 2009. All courses were assigned a PETS code aligned with the 2010 Classification of Instructional Programs (CIP) taxonomy developed by NCES (Wine, Janson, and Wheeless 2011). Remedial courses were designated based on course titles and content descriptions. In general, courses described with terms like *developmental, remedial, precollegiate,* and *basic skills* were considered remedial.

Identifying remedial courses is often difficult because there is no universally accepted definition of remedial courses, course descriptions do not always carry explicit terms to signify that the courses are remedial, and institutions also have varying policies and practices on remediation (Bobo et al. 2013; Institute for Higher Education Policy 1998; Lewis and Farris 1996; Wine, Janson, and Wheeless 2011).[19] Lewis and Farris (1996), for example, found that institutions had different policies for English as a second language (ESL): 38 percent of institutions offering ESL courses considered all of these courses to be remedial, while another 38 percent considered none of their ESL courses to be remedial. Given these uncertainties, it is likely that in this study some courses that are not remedial have been classified as remedial and some courses that are remedial have not been identified as such. For detailed information about how PETS codes were derived and how courses were coded in the BPS:04/09 PETS data file, see Wine, Janson, and Wheeless (2011) and Bryan (2012). Appendix D provides a detailed list of the courses classified as remedial in this study.

College-Level Courses. In theory, any course that offers credit and leads to a degree or certificate from a postsecondary institution is a college-level course. In reality, however, the criteria and guidelines used to determine the level of courses may vary among institutions and states, resulting in inconsistent definitions. For simplicity, this study combined all English and math courses in PETS:09 that are not designated as remedial into college-level English and math courses, respectively. This classification strategy may result in counting some vocational courses—especially those where the distinction between remedial and college-level courses is blurred (e.g., technical

[19] Focus groups involved in BPS:04/09 data collection indicated that "identifying remedial courses was sometimes difficult, for instance when the course description sounded like it could be remedial but without stating so explicitly. In such cases, keyer/coders were sometimes able to confirm a course was remedial by noting a grade greater than an F with no credits awarded" (Wine, Janson, and Wheeless 2011, p. 67).

math)—as college-level courses. While this study cannot determine the nature of these vocational courses, it is important to note that the vast majority of U.S. postsecondary institutions offer vocational or career and technical education courses designed to prepare students for jobs after college (Levesque et al. 2008). These courses are concentrated in 2-year institutions,[20] and credits earned in these courses often lead to an associate's degree or a certificate. See appendix D for a detailed list of all college-level English and math courses used in this study.

Remedial Students. This study referred to students who took at least one remedial course during their college enrollment as *remedial students*. The percentage of remedial students reported in this study indicates the extent of remedial course participation but not the full extent of the need for remediation.

Nonremedial Students. This study referred to students who did not take remedial courses during their college enrollment as *nonremedial students*. Because not all institutions strictly enforce remediation for students deemed as underprepared for college (Bailey and Cho 2010), some students who are referred to remedial courses may skip remedial coursework entirely. By definition, such students were included in the nonremedial group in this study. It is important to note that the term *nonremedial students* used in this study simply indicates that these students did not participate in remedial coursetaking in college. It does not mean that all students in this group were college ready and thus not in need of remedial coursework.

Remedial Completers, Partial Remedial Completers, and Remedial Noncompleters. Not all students who enrolled in remedial courses completed them. This study identified three groups of remedial students based on their remedial course completion status: *remedial completers* are those who completed all the remedial courses they attempted; *partial remedial completers* are those who completed some but not all of the remedial courses they attempted; and *remedial noncompleters* are those who did not complete any remedial courses they attempted.

Organization

The analysis of this report was organized into three main sections. The first section documented how much remediation occurred among postsecondary students beginning at public 2- and 4-year institutions, described what kinds of students took remedial courses, and determined the timing of their remedial enrollment and completion rates. The second section focused on remedial students who attained various levels of success in remedial coursework, comparing their postsecondary

[20] For example, among all BPS:04/09 students who took technical math (PETS codes 27.9991 and 27.9993), 81 percent started their postsecondary education at 2-year or less-than-2-year institutions.

outcomes to those of students who did not enter remediation. The third section turned to multivariate analysis, exploring whether remedial coursetaking had any association with various postsecondary outcomes after controlling for other characteristics available in BPS:04/09 that are identified in the literature as important to both the need for remediation and success in college. The multivariate analysis also explored the interaction between remediation and academic preparation while controlling for other characteristics, determining whether the association of remediation with various outcomes differs or is conditioned by students' prior preparation for college. It is important to note that although the multivariate results may suggest topics for further research that might examine questions of causality, this study remains descriptive and does not purport to identify causal relationships and determine the effects of remediation.

Data Sources and Study Sample

Data Sources

Data for this report came from BPS:04/09 and its associated transcript study, PETS:09. BPS:04/09 followed a nationally representative sample of first-time college students who began postsecondary education in 2003−04 for a total of 6 years, through 2009. BPS sample members were initially identified in the 2003–04 National Postsecondary Student Aid Study (NPSAS:04).[21]

Approximately 19,000 NPSAS:04 sample members were confirmed as first-time beginning students. Interviews were then conducted three times: in 2004, around the end of their first year in postsecondary education; in 2006, about 3 years after students' initial college entry; and in 2009, about 6 years after students first enrolled. Through student interviews and other sources, data collected include students' demographic characteristics; their persistence in and completion of postsecondary education programs; their transition into employment; and changes over time in their goals, marital status, income, and debt, among other indicators. The final BPS:04/09 dataset contains information on approximately 16,700 students.

In 2009, for the first time in the history of the BPS administrations, BPS:04/09 collected transcript data from every institution that BPS students attended between July 2003 and June 2009. About 91 percent of the eligible students had at least one

[21] NPSAS:04 is a nationally representative sample of about 90,000 undergraduate, graduate, and first-professional students in about 1,600 postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico who are eligible to participate in federal Title IV student aid programs. It is a comprehensive study that examines how undergraduates and graduate and first-professional students and their families pay for postsecondary education.

transcript available for analysis. The transcripts provided a detailed portrait of students' enrollment, coursetaking, credit accumulation, academic performance, and degree histories. More information about BPS:04/09 and its transcript component can be found in appendix B.

Study Sample

To provide a longitudinal look at remedial coursetaking and its association with short- and long-term outcomes, this study focused on approximately 16,100 students who participated in the initial BPS:04/09 survey in 2003−04 as well as in the two follow-up surveys in 2006 and 2009. The sample was further narrowed to students who began their postsecondary education at public 2- and 4-year institutions and who also had transcript data available for analysis. After these selections, the final study sample consisted of about 9,000 students—approximately 5,000 who began their postsecondary education at public 2-year institutions and 4,000 who began at public 4-year institutions.[22] Because these two groups of students participated in remediation at different rates, they were analyzed separately throughout the study. For brevity, the two groups are sometimes referred to as "students at public 2- or 4-year institutions" or "public 2- or 4-year college students" in the text, although some students subsequently transferred to a different level of institution.

Limitations

Readers should be aware of the following limitations of this study. First, because BPS:04/09 is a general-purpose survey on postsecondary education, its questions and survey elements were not specifically tailored to include all variables relevant to research on college remediation. Some factors identified in the literature as potentially important to remedial coursetaking (e.g., placement test scores; remedial course sequences; students' motivation, engagement, and study skills; and institutions' remediation policies and implementation) were not measured in BPS:04/09. Consequently, the multivariate analysis in this study cannot control for all the factors that are potentially related to remedial course enrollment and success, and the results of this analysis may be biased. For example, the difference in an outcome between remedial and nonremedial students may be attributable to some unmeasured attributes, such as students' self-efficacy, motivation, and study skills, rather than taking remedial coursework per se (MacArthur, Philippakos, and Graham

[22] For information on whether and how students who began at public 2- and 4-year institutions differed from those who started at other types of institutions, see Radford and Horn (2012) and Skomsvold, Radford, and Berkner (2011).

2015). Readers are cautioned not to draw conclusions regarding causality based on the descriptive findings presented in this report.

Second, this study reported data only on student participation in remedial coursework in college. BPS:04/09 did not collect assessment/placement data, which would have allowed the analysis to take into account students' skill level when they entered college. Prior research documents a gap between referral to remediation and actual remedial enrollment (i.e., not all underprepared students take the remedial courses that the institution recommends for them) (Bailey, Jeong, and Cho 2010). Thus, the group of nonremedial students in this study includes both students who are college ready and thus not in need of remedial coursework and those who may have been in need of such coursework. It is important to note that the findings presented here reflect only remedial course participation and not the full extent of the need for remediation among the 2003−04 cohort of beginning postsecondary students.

Third, the design of this study would be strengthened if the multivariate analysis could control for the level or sequence of remediation. Many colleges offer multiple levels of remedial coursework in each subject area and place students into a particular level according to placement test scores (Boatman and Long 2010). Students who are placed into the lower levels usually have more remedial courses to take and are therefore at greater risk of not completing remediation. Due to lack of appropriate data in BPS:04/09 (e.g., remedial referral, placement, and course sequence), it is impossible to incorporate the level and sequence of remediation into the analysis in this study.

Fourth, the terms *remedial completers*, *partial remedial completers*, and *remedial noncompleters* as defined in this study do not perfectly reflect students' success or failure in remediation. Without remedial placement and course sequence data in BPS:04/09, remedial completers as defined in this study may include, for example, students who completed low-level remedial courses (e.g., arithmetic) and moved on to college-level courses without taking the next level of remedial courses (e.g., intermediate algebra) in a sequence. At the same time, partial remedial completers and noncompleters may include, for example, students who were required to take only high-level remedial courses and took them but failed some or all. In this regard, some partial completers and noncompleters may have been more advanced in the remedial sequence than some remedial completers. If these three remedial groups were defined accurately (e.g., if remedial completers were only those who completed the entire remedial sequence recommended for them by their institution), the differences among these three groups may be different from what are observed in this analysis.

Fifth, one critical piece of information needed for research on remediation—students' precollege academic preparation—is missing for some students. BPS:04/09 collected data on students' high school grades, the highest math course taken in high school, and college entrance exam scores, all of which were used to construct a composite measure of precollege academic preparation (see appendix A for a detailed construction of this variable). However, information on these measures was not collected for certain students (mainly those who were age 24 or older at the time of the interview).[23] Consequently, all estimates pertinent to students' precollege academic preparation are only applicable for students under age 24.

Lastly, this report used transcript data to identify remedial courses. While transcript data may produce more accurate estimates of remedial coursetaking than students' self-reported data do, they have several drawbacks that may induce potential biases. For example, complete transcripts were not received for about 13 percent of sample members in PETS:09 (Wine, Janson, and Wheeless 2011). In addition, some transcripts may have had missing data. The absence of complete or partial transcript information for some students may lead to underestimates of remedial coursetakers in this report.

[23] About 13–26 percent of beginning public 2- and 4-year college students in BPS:04/09 had missing data on their high school GPA (18 percent); math coursetaking in high school (13 percent); and college admission test scores (26 percent). Because the composite measure of precollege academic preparation was derived from these three academic indicators, it has missing data for about 13 percent of the study sample. To retain these missing cases in the analysis, they were put into an "unknown" category in the composite measure of precollege academic preparation (see appendix A for more information about the construction of this variable).

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Remedial Coursetaking: Scope, Intensity, Timing, and Completion Rates at Public 2- and 4-Year Institutions

This section begins with an overview of remedial coursetaking among a cohort of students who started their postsecondary education at public 2- and 4-year institutions in 2003−04. It provides descriptive statistics on the scope and intensity of remediation at these two types of institutions, characteristics of students who entered remediation, their timing of entrance, and their remedial completion rates.

Scope and Intensity of College Remediation

Remedial coursetaking was widespread among students who began their postsecondary education in 2003−04: about 68 percent of those who started at public 2-year institutions and 40 percent of those who started at public 4-year institutions took at least one remedial course during their postsecondary enrollment between 2003 and 2009 (table 1). Math remediation was more common than

Table 1.
REMEDIAL COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who took remedial courses in various fields, and of those students, average number of remedial courses taken: 2003−09

Remedial coursetaking	Students beginning at public 2-year institutions	Students beginning at public 4-year institutions
Percent taking remedial courses in any field	68.0	39.6
Percent taking two or more remedial courses	47.9	20.7
Percent taking remedial English/reading	28.1	10.8
Percent taking remedial math	59.3	32.6
Percent taking remedial courses across multiple subject areas	26.1	9.3
Average number of remedial courses taken	2.9	2.1

NOTE: Estimates in this table include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

English/reading remediation: 59 percent of students entering public 2-year institutions and 33 percent of students entering public 4-year institutions took a remedial math course, whereas enrollment rates in remedial English/reading courses were 28 and 11 percent at public 2- and 4-year institutions, respectively.[24]

Remediation was more intensive among students who began at public 2-year institutions than among their peers who began at public 4-year institutions. For example, proportionally more students beginning at public 2-year institutions than at public 4-year institutions took two or more remedial courses (48 percent vs. 21 percent) and took remedial courses across multiple subjects (26 percent vs. 9 percent). On average, remedial students at public 2-year institutions took about three remedial courses, while those at public 4-year institutions took two remedial courses.

Characteristics of Remedial Coursetakers

Because remedial courses are designed to strengthen limited academic skills, remediation is highly concentrated among students with weak academic preparation. At public 2-year institutions, 75 percent of beginning students with weak academic preparation took remedial courses, compared with 48 percent of those with strong academic preparation (figure 1). At public 4-year institutions, the remediation rate for weakly prepared students was more than four times the rate for strongly prepared students (77 percent vs. 18 percent).

Nevertheless, the common perception that remedial coursework is strictly the domain of students with weak academic skills is not accurate. BPS:04/09 data show that many weakly prepared students did not take any remedial courses in college (25 and 23 percent at public 2- and 4-year institutions, respectively), while substantial shares of those with strong academic preparation did so (48 and 18 percent at public 2- and 4-year institutions, respectively) (figure 1). These findings may reflect misalignment between high school and college standards, varying policies on remediation across states, and the different assessment and placement strategies used by different institutions[25] (Bettinger and Long 2007; Dillon and Smith 2013; Hughes and Scott-Clayton 2011; Kurlaender and Howell 2012; Merisotis and Phipps 2000).

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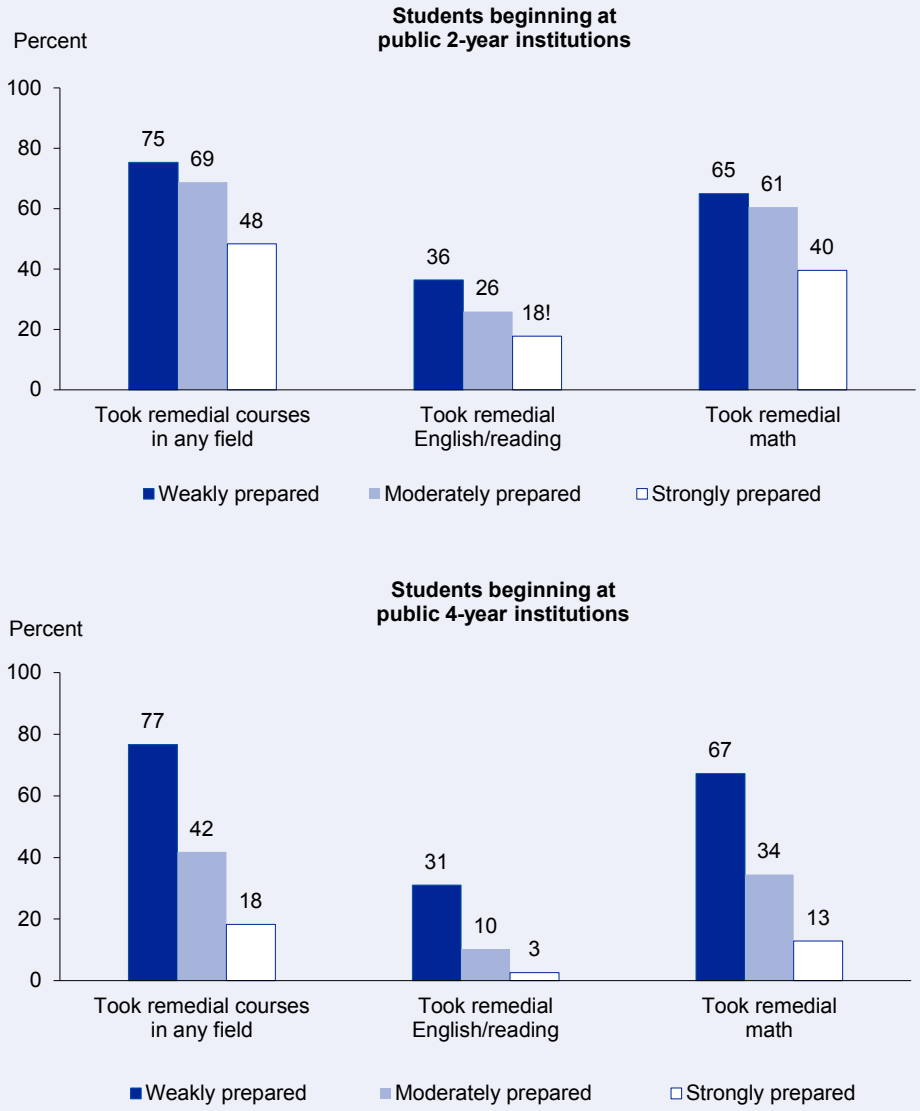
[24] All bivariate comparisons in this study were tested for statistical significance using a two-tailed Student's *t* statistic to ensure that the differences were larger than might be expected due to sampling variation. Unless specifically noted, all differences cited in the report were statistically significant at the .05 level. Adjustments were not made for multiple comparisons; consequently, some differences noted here might not be significant if multiple comparison procedures were used.

[25] These findings could also be caused by arbitrary cutoffs and the coarseness of the composite academic preparation measure used in this study. See appendix A for a detailed construction of this composite measure.

Figure 1.
REMEDIAL COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who took remedial courses in various fields, by precollege academic preparation: 2003–09



! Interpret data with caution. Estimate is unstable because the standard error represents more than 30 percent of the estimate.

NOTE: Precollege academic preparation is a composite measure derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24 (87 percent of the study sample). See appendix A for a detailed construction of this variable. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Remediation was more common among several demographic groups typically associated with having weak academic preparation. At public 2-year institutions, 78 percent of Black students and 75 percent of Hispanic students (vs. 64 percent of White students) and 76 percent of students who were in the lowest income group (vs. 59 percent of those in the highest) took remedial courses (table 2). Similar differences were also found at public 4-year institutions: 66 percent of Black students and 53 percent of Hispanic students, compared with 36 percent of White students, took remedial courses; 52 percent of students in the lowest income group took remedial courses, while 33 percent of those in the highest income group did so.

Remediation was also more prevalent among first-generation students and among older students at public 4-year institutions (54 percent for students whose parents had no more than a high school education vs. 31 percent for students whose parents earned a bachelor's or higher degree; 66 percent for students age 24 or older vs. 39 and 37 percent for those age 19 and age 18 or younger, respectively), but the differences by level of parental education were not detected[26] and the difference by age was reversed[27] at public 2-year institutions (table 2). Furthermore, proportionally more females than males at public 2-year institutions took remedial courses (71 percent vs. 65 percent), but the sex difference was not detected at public 4-year institutions.

[26] An undetected difference between two estimates is not equivalent to no difference. The former implies that the difference may exist but is not detected given the sample size and standard errors of the estimates, while the latter represents the true equivalence between the two estimates.

[27] Among students who started at public 2-year institutions, 70 and 69 percent for those age 19 and age 18 or younger, respectively, compared with 62 percent of those age 24 or older, took remedial courses.

Table 2.
REMEDIAL COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who took remedial courses in any field, and of those students, average number of remedial courses taken, by selected characteristics: 2003−09

Selected characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Percent taking remedial courses in any field	Average number of remedial courses taken	Percent taking remedial courses in any field	Average number of remedial courses taken
Total	**68.0**	**2.9**	**39.6**	**2.1**
Sex				
Male	64.6	2.9	37.2	2.1
Female	70.7	3.0	41.4	2.2
Race/ethnicity[1]				
White	63.6	2.4	35.8	1.8
Black	78.3	3.5	65.9	2.8
Hispanic	74.9	4.0	52.6	2.8
Asian	68.1	3.5	30.4	2.1
All other races	71.4	3.1	28.4	2.3
Age in 2003–04				
18 or younger	69.1	2.8	36.7	2.1
19	69.6	3.0	38.7	2.0
20–23	73.3	3.0	53.6	2.3
24 or older	62.1	3.0	65.9	3.1
Highest education of parents				
High school or less	68.9	3.2	53.6	2.4
Some college	69.0	2.7	45.0	2.2
Bachelor's degree or higher	64.8	2.8	31.4	1.9
Income level[2]				
Lowest 25 percent	75.5	3.5	51.7	2.5
Lower middle 25 percent	71.2	2.8	42.7	2.1
Upper middle 25 percent	65.7	2.8	35.3	1.9
Highest 25 percent	59.0	2.6	32.9	2.0
Precollege academic preparation[3]				
Unknown	62.1	3.0	65.9	3.1
Weak	75.3	3.1	76.7	2.7
Moderate	68.8	2.8	41.8	2.0
Strong	48.3	2.1	18.3	1.4

See notes at end of table.

Table 2.
REMEDIAL COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who took remedial courses in any field, and of those students, average number of remedial courses taken, by selected characteristics: 2003−09—Continued

Selected characteristics	Students beginning at public 2-year institutions: Percent taking remedial courses in any field	Students beginning at public 2-year institutions: Average number of remedial courses taken	Students beginning at public 4-year institutions: Percent taking remedial courses in any field	Students beginning at public 4-year institutions: Average number of remedial courses taken
Selectivity of first-attended 4-year institution[4]				
Highly selective	†	†	27.5	1.7
Moderately selective	†	†	37.4	2.1
Minimally selective	†	†	58.3	2.5

† Not applicable.

[1] Black includes African American, Hispanic includes Latino, and "All other races" includes American Indian, Alaska Native, Native Hawaiian, Other Pacific Islander, and individuals who indicated Two or more races or Other.

[2] The total income in 2003–04 for independent students or parents of dependent students.

[3] This was derived from three precollege academic indicators: high school GPA, highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the "unknown" category. See appendix A for a detailed construction of this variable.

[4] The selectivity of institution was developed only for public and private nonprofit 4-year institutions using the following criteria: whether the institution was open admission (had no minimal requirements); the number of applicants; the number of students admitted; the 25th and 75th percentiles of ACT and/or SAT scores; and whether test scores were required for admission. For more information, see Cunningham, A.F. (2006). *Changes in Patterns of Prices and Financial Aid* (NCES 2006-153). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

NOTE: Estimates in this table include students enrolled in Title IV–eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

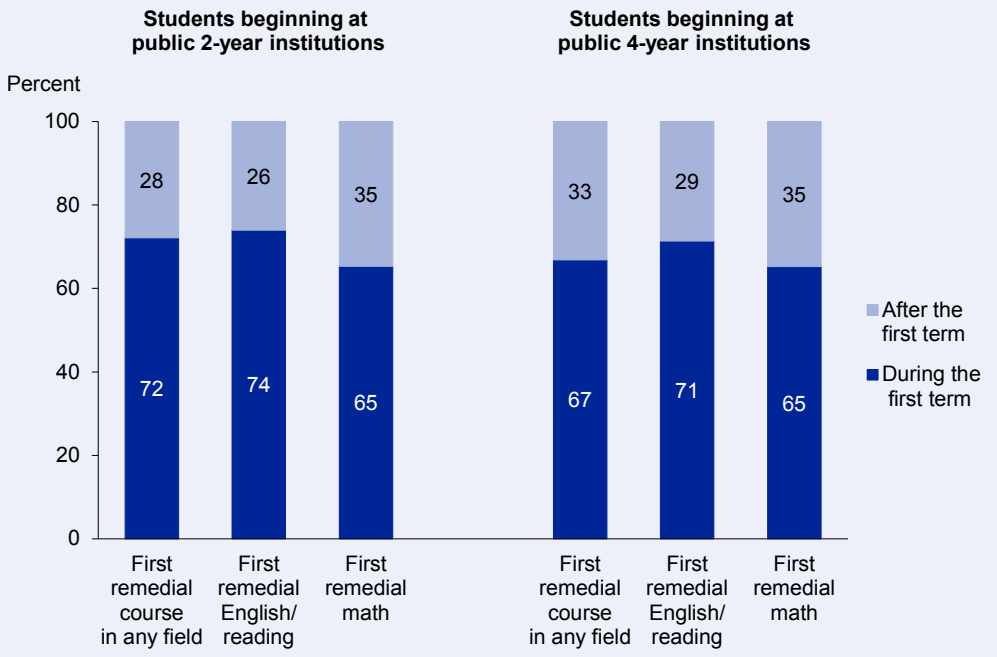
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Regardless of these subgroup differences, college remedial coursetaking overall is a widespread phenomenon, involving both disadvantaged and advantaged populations. For example, among students who began at public 2-year institutions and came from high-income or college-educated families, a majority participated in remedial education (59 and 65 percent, respectively) (table 2). Among students who began at 4-year institutions, about a third of students in these groups (33 and 31 percent, respectively) participated in remedial education. In addition, nearly 30 percent of students who first entered highly selective 4-year institutions took at least one remedial course during the course of their postsecondary enrollment.

Timing of Remedial Coursework

The majority of remedial coursetakers—72 percent of those beginning at public 2-year institutions and 67 percent of those beginning at public 4-year institutions—enrolled in remedial courses during the first term of college attendance (defined as the first 3 months after entering college) (figure 2). About 74 percent of remedial English/reading coursetakers at public 2-year institutions and 71 percent of those at public 4-year institutions first took their remedial English/reading coursework in the first term, whereas 65 percent of remedial math coursetakers at both types of institutions first took their remedial math coursework at that time.

Figure 2.
REMEDIAL COURSETAKING TIMING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions and took remedial courses, percentage distribution of students according to their first remedial course enrollment time: 2003–09



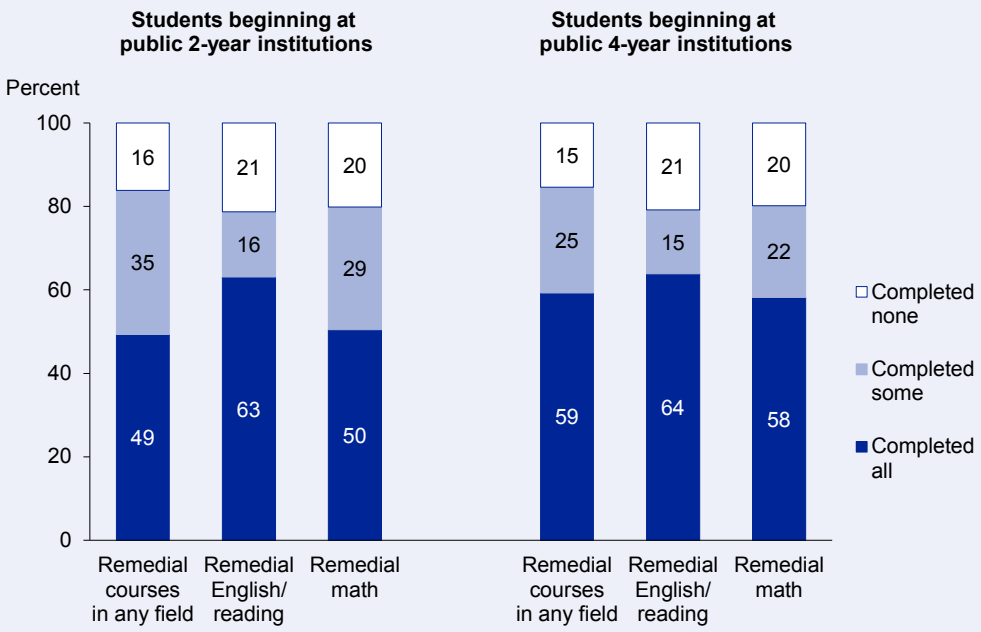
NOTE: "First term" is defined as the first 3 months after initial postsecondary entry. Detail may not sum to totals because of rounding. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Remedial Course Completion Rates

Many students who enrolled in remedial courses did not complete them. At public 2-year institutions, just about half of remedial coursetakers (49 percent) completed all the remedial courses that they attempted (i.e., earned a passing grade or some credits); the remaining either completed some (35 percent) or none of these courses (16 percent) (figure 3).

Figure 3.
REMEDIAL COURSE COMPLETION STATUS: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions and took remedial courses, percentage distribution of students according to their remedial course completion status in various fields: 2003–09



NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Detail may not sum to totals because of rounding. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Remedial course completion rates were somewhat higher at public 4-year institutions: 59 percent of students who took remedial courses completed all the attempted courses. Partial remedial completers and noncompleters accounted for 25 and 15 percent, respectively, of all remedial coursetakers at public 4-year institutions.

Students who began at public 2-year institutions were less successful in remedial math courses than in remedial English/reading courses. For example, at public 2-year institutions, 63 percent of students who attempted remedial English/reading

courses completed all of these courses, while 50 percent of students who attempted remedial math courses completed all of these courses. No difference, however, was detected among students who began at public 4-year institutions (figure 3).

Remedial course completion rates were inversely related to the number of remedial courses that students took. At public 2-year institutions, 73 percent of those who took only one remedial course completed the course, while 25 percent of those who took four or more remedial courses completed all the courses attempted (table 3). Similarly, at public 4-year institutions, 80 percent of those who took only one remedial course completed the course, while 17 percent of those who took four or more remedial courses completed all the courses attempted.

Table 3.
REMEDIAL COURSE COMPLETION STATUS: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions and took remedial courses, percentage distribution of their remedial course completion status, by number of remedial courses taken and precollege academic preparation: 2003–09

Number of remedial courses taken and precollege academic preparation	Students beginning at public 2-year institutions			Students beginning at public 4-year institutions		
	Completed all	Completed some	Completed none	Completed all	Completed some	Completed none
Total	**49.3**	**34.6**	**16.1**	**59.3**	**25.3**	**15.4**
Number of remedial courses taken						
One	73.3	†	26.7	79.8	†	20.2
Two	54.8	27.7	17.4	57.4	29.7	12.9
Three	40.4	51.7	8.0	33.5	53.9	12.6 !
Four or more	25.0	66.1	8.9	16.7	76.8	6.5
Precollege academic preparation[1]						
Unknown	54.4	29.8	15.9	44.7	44.5	10.9 !
Weak	41.2	39.1	19.7	47.8	35.5	16.6
Moderate	51.6	34.7	13.7	61.4	23.5	15.1
Strong	56.0	25.8 !	‡	74.2	8.0	17.8

† Not applicable.

! Interpret data with caution. Estimate is unstable because the standard error represents more than 30 percent of the estimate.

‡ Reporting standards not met.

[1] This was derived from three precollege academic indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the "unknown" category. See appendix A for a detailed construction of this variable.

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Detail may not sum to totals because of rounding. Estimates in this table include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

As noted earlier, reasons why students who otherwise appear to have strong academic preparation for college take remedial courses may have to do with local policies or cutoff placement scores. Consistent with their academic preparation, these students had higher remedial course completion rates than their peers with weak academic preparation did. For example, at public 4-year institutions, 74 percent of remedial coursetakers with strong academic preparation passed all remedial courses attempted, compared with 48 percent of those with weak academic preparation (table 3).[28]

[28] The remedial course completion rate at public 2-year institutions for strongly prepared students (56 percent) appeared to be higher than that for weakly prepared students (41 percent), but the apparent difference was not significant due to large standard errors.

Postsecondary Outcomes of Remedial and Nonremedial Students

This section examines several key outcomes of remedial students, including whether they enrolled in college-level, credit-bearing English and math courses, earned any credits in these courses, transferred to a 4-year institution (for public 2-year college students only), persisted through their college years, earned sufficient college-level credits for graduation, and eventually attained a postsecondary degree. The analysis was performed for remedial completers, partial completers, and noncompleters, determining whether students with various levels of success in remedial coursework had different postsecondary outcomes. To provide a context and comparison, the analysis also included the outcomes of students who did not take any remedial courses.

College-Level English and Mathematics Coursetaking

Enrolling and Earning Credits in College-Level English Courses.[29] Most degree programs, particularly at 4-year institutions, require students to take college-level English courses as a part of their general education coursework. This is reflected in the BPS sample: the majority of 2003−04 first-time freshmen beginning at public 2- or 4-year institutions (78 and 94 percent, respectively) took at least one college-level English course while enrolled (table 4).

Nevertheless, enrollment in college-level English courses differed among students with various levels of success in English/reading remediation. At public 2-year institutions, 85 percent of remedial English/reading completers took college-level English courses and 77 percent of them also earned some credits in these courses; both percentages were higher than those for partial remedial English/reading completers (67 and 50 percent, respectively), noncompleters (64 and 48 percent, respectively), and even students who did not take any remedial English/reading courses (78 and 70 percent, respectively). Similar apparent differences at public 4-year institutions were not statistically significant however.

[29] College-level English courses consist of all credit-bearing English courses that are not designated as remedial. For a detailed classification of college-level English courses, see appendix D.

Table 4.
COLLEGE-LEVEL ENGLISH COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who enrolled and earned any credits in college-level English courses, by remedial English/reading course enrollment and completion status: 2003−09

Remedial English/reading course enrollment and completion status	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Enrolled in college-level English courses	Earned college-level English credits	Enrolled in college-level English courses	Earned college-level English credits
Total	**77.9**	**69.4**	**93.8**	**91.0**
Enrolled in remedial English/reading courses	78.0	67.0	92.3	87.3
Completed all	85.3	77.5	95.6	90.7
Completed some	67.5	49.7	88.3	84.3
Completed none	64.1	48.0	85.3	79.2
Did not enroll in remedial English/reading course	77.8	70.4	94.0	91.4

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this table include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Enrolling and Earning Credits in College-Level Mathematics Courses.[30] The overall enrollment rate in college-level math courses was not as high as that for college-level English courses: 54 percent of beginning public 2-year college students and 85 percent of beginning public 4-year college students took a college-level math course while enrolled (table 5).

Enrollment in college-level math courses varied widely among students according to their completion status in remedial math coursework. At public 2-year institutions, for example, 71 percent of remedial math completers took college-level math courses, and 62 percent of them also earned some credits in these courses; both percentages were higher than those for partial remedial math completers (44 and 36 percent, respectively), noncompleters (32 and 18 percent, respectively), and students who did not take any remedial math courses (53 and 48 percent, respectively).

[30] College-level math courses consist of all credit-bearing math courses that are not designated as remedial. For a detailed classification of college-level math courses, see appendix D.

Table 5.
COLLEGE-LEVEL MATH COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who enrolled and earned any credits in college-level math courses, by remedial math course enrollment and completion status: 2003−09

Remedial math course enrollment and completion status	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Enrolled in college-level math courses	Earned college-level math credits	Enrolled in college-level math courses	Earned college-level math credits
Total	**54.3**	**46.3**	**84.7**	**79.3**
Enrolled in remedial math courses	55.2	45.2	75.9	66.9
Completed all	71.1	61.7	83.7	75.0
Completed some	43.9	35.7	69.8	59.1
Completed none	31.7	18.0	59.3	51.5
Did not enroll in remedial math course	53.0	47.7	89.0	85.3

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this table include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

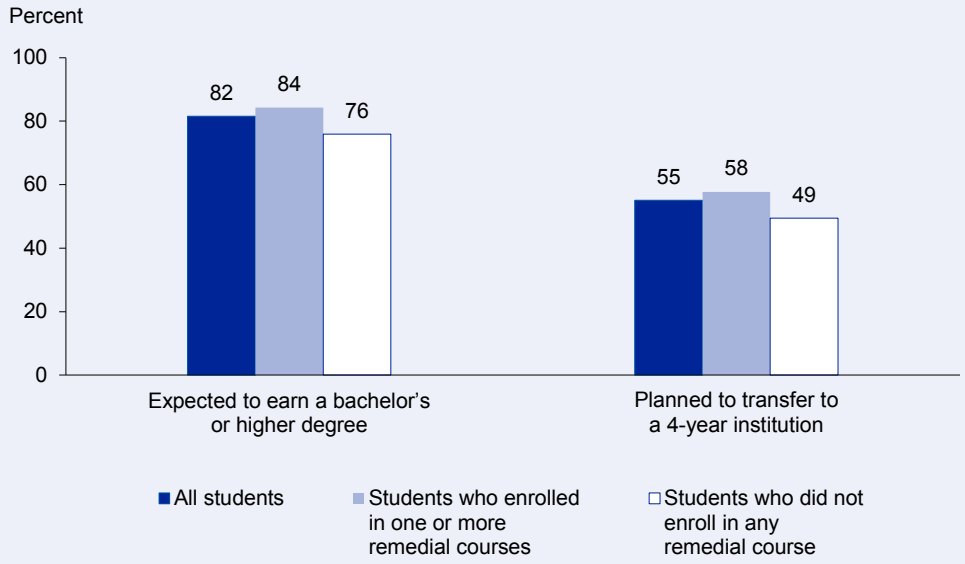
Patterns were largely similar at public 4-year institutions: proportionally more remedial math completers enrolled and earned credits in college-level math courses (84 and 75 percent, respectively) than partial completers (70 and 59 percent, respectively) and noncompleters (59 and 51 percent, respectively) did. However, students who took no remedial math courses enrolled and earned credits in college-level math courses at the highest rates (89 and 85 percent, respectively), surpassing remedial math completers, partial completers, and noncompleters.

Transfer to a 4-Year Institution

Many students began at community colleges with a goal of attaining a bachelor's or advanced degree: 82 percent of students entering public 2-year institutions said at the beginning of college that they expected to earn a bachelor's or graduate degree (figure 4). Students' expectations, however, may not accurately represent their plans because many students do not understand that bachelor's or graduate degrees cannot be earned at 2-year institutions, for example, or that these degrees may not be necessary to work in their intended occupation (Rosenbaum, Deil-Amen, and Person 2009). For instance, when asked whether they planned to transfer to a 4-year institution, 55 percent indicated that they intended to do so, proportionally fewer than the 82 percent who said they expected to earn a bachelor's or advanced degree. The

percentage of students who actually transferred to a 4-year institution was even lower. Based on several measures that describe transfer behaviors in BPS:04/09, one-quarter of beginning public 2-year college students first transferred to a 4-year institution;[31] 29 percent were last enrolled in a 4-year institution as of 2009; and 32 percent reported ever attending a 4-year institution from 2003 to 2009 (table 6). These figures increased somewhat when the sample was further restricted to students who expressed an interest in transferring to a 4-year institution or those who expected to earn a bachelor's or higher degree. For example, among beginning public 2-year college students who planned to transfer to a 4-year institution, 37 percent first transferred to a 4-year institution; 41 percent were last enrolled in a 4-year institution; and 45 percent reported ever attending a 4-year institution between 2003 and 2009.

Figure 4.
TRANSFER PLANS AND POSTSECONDARY EXPECTATIONS: Among 2003–04 beginning postsecondary students who first enrolled in public 2-year institutions, percentage who expected to earn a bachelor's or higher degree or planned to transfer to a 4-year institution, by remedial course enrollment status: 2003–04



NOTE: Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

[31] Some students transferred multiple times, and those who did not transfer to a 4-year institution for their first time may have done so later.

Table 6.
TRANSFER: Among 2003–04 beginning postsecondary students who first enrolled in public 2-year institutions, percentage who have transferred to or attended a 4-year institution through 2009, by remedial course enrollment and completion status: 2003–09

Remedial course enrollment and completion status	First transfer was to a 4-year institution[1]			Last institution enrolled was a 4-year institution			Ever attended a 4-year institution		
	All students	Students who planned to transfer	Students who expected to earn a bachelor's or higher degree	All students	Students who planned to transfer	Students who expected to earn a bachelor's or higher degree	All students	Students who planned to transfer	Students who expected to earn a bachelor's or higher degree
Total	**25.5**	**37.1**	**29.5**	**28.9**	**41.1**	**33.1**	**32.0**	**44.9**	**36.5**
Enrolled in remedial courses	24.2	33.3	27.2	28.4	38.0	31.4	31.2	40.9	34.2
Completed all	30.8	43.1	36.2	35.7	48.9	40.8	37.9	51.0	42.9
Completed some	17.8	22.7	18.2	21.7	27.1	22.5	25.0	30.5	26.0
Completed none	17.7	26.3	20.2	20.2	27.7	23.2	23.8	32.2	26.3
Did not enroll in remedial course	28.2	46.7	35.0	30.0	48.8	37.2	33.7	54.9	41.9

[1] A transfer occurs when a student leaves one institution (the origin) and enrolls in another institution (the destination) for 4 or more months. This definition does not take into account whether transfer credits were granted.

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Regardless of which measure was used, remedial completers consistently transferred at a higher rate than partial completers and noncompleters did. For example, 31 percent of remedial completers, compared with 18 percent of partial completers and noncompleters, first transferred to a 4-year institution; 36 percent of remedial completers, compared with 22 percent of partial remedial completers and 20 percent of remedial noncompleters, attended a 4-year institution as their last institution through 2009; and 38 percent of remedial completers, compared with 25 percent of partial completers and 24 percent of remedial noncompleters, ever attended a 4-year institution from 2003 to 2009. Nonremedial students had higher transfer rates (e.g., 28 percent first transferred to a 4-year institution) than partial remedial completers (18 percent) and noncompleters (18 percent) did, but there were no measurable differences when compared with remedial completers (31 percent).

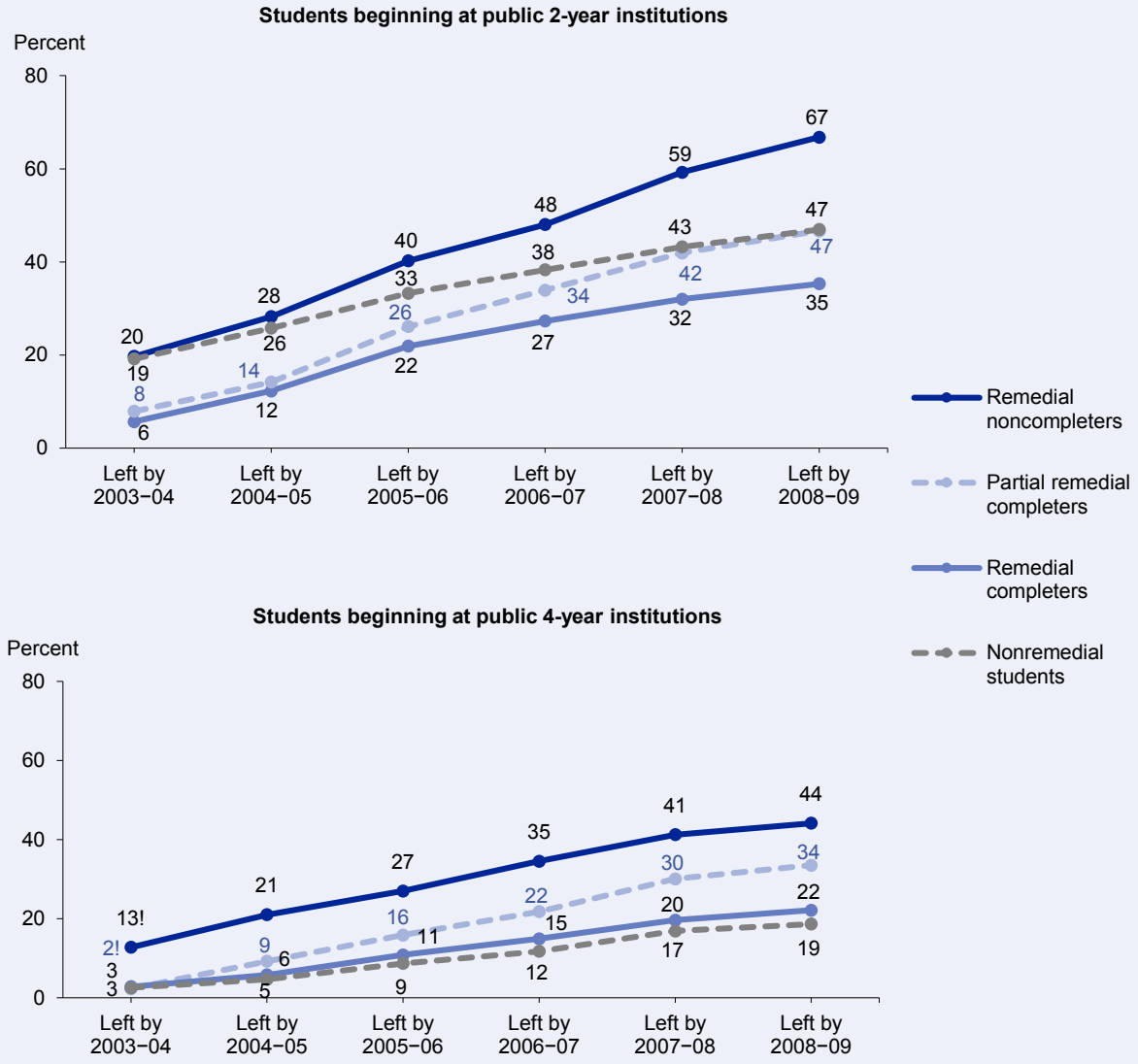
Persistence in College

Remedial students' low likelihood of persisting in college has been noted by a number of researchers (Kurlaender and Howell 2012), although attending college without earning a certificate or degree may be sufficient for some occupations. Some have argued that placement into remediation may lower students' self-esteem, reduce their educational expectations, and increase their frustrations, all of which may discourage them from persisting in college (Deil-Amen and Rosenbaum 2002; Rosenbaum 2001).

Low levels of college persistence are not uniformly distributed across remedial student groups however. Figure 5 presents cumulative percentages of students who had left college without a degree or certificate by the end of each school year from 2003 to 2009 and had not returned as of 2009 (referred to as "dropout rates" below for simplicity).[32] It shows that remedial completers at both levels of public institutions had consistently lower dropout rates (therefore higher persistence rates) than remedial noncompleters did. For example, 35 percent of remedial completers at public 2-year institutions and 22 percent of those at public 4-year institutions had left postsecondary education without a degree or certificate by 2009, percentages that were about half those of remedial noncompleters at public 2- and 4-year institutions (67 and 44 percent, respectively). Partial remedial completers at both levels of public institutions had dropout rates similar to those of remedial completers initially, but differences between the two groups began to emerge in 2006−07 (the fourth year). By 2009, some 47 and 34 percent of partial remedial completers at public 2- and 4-year institutions, respectively, had dropped out of college, while 35 and 22 percent of remedial completers at these institutions, respectively, had done so.

[32] Students who left postsecondary education without a degree or certificate in early years (e.g., 2004) but re-enrolled in later years (e.g., 2009) were not considered as leaving postsecondary education in this measure. Depending on the academic year in BPS:04/09, about 6–11 percent of students left school without a degree or certificate in an academic year but returned to school later.

Figure 5.
COLLEGE ATTRITION: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who had left postsecondary education without a degree or certificate by the end of each academic year and had not returned as of 2009, by remedial course enrollment and completion status: 2003–09



! Interpret data with caution. Estimate is unstable because the standard error represents more than 30 percent of the estimate.

NOTE: "Left by 2008–09" means left by the interview time in spring 2009. Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Remedial completers who began at public 2-year institutions also had consistently lower dropout rates than those who had never entered remediation. As of 2009, for example, 35 percent of remedial completers, compared with 47 percent of

nonremedial students, had left college without a degree or certificate. At public 4-year institutions, the cumulative dropout rates through 2009 for remedial completers (22 percent) and nonremedial students (19 percent) were not measurably different.

College Credit Accumulation

An important predictor of students' college completion is their accumulation of sufficient credits in the first year of college. Adelman (2006) estimated that earning 20 credits in a student's first year of enrollment significantly increased his or her odds of later attaining a degree or credential. In the current study, remedial completers who began at public 2-year institutions earned an average of 20 credits in the first year and accumulated a total of 70 credits as of 2009, both of which were higher than the number of first-year and total credits earned by partial remedial completers (15 and 50 credits, respectively), noncompleters (9 and 28 credits, respectively), and nonremedial students (16 and 51 credits, respectively) (table 7). The pattern was similar at public 4-year institutions, except that remedial completers earned fewer credits than nonremedial students in the first year (25 credits vs. 27 credits) and both groups accumulated similar numbers of credits through 2009 (108 and 110 credits, respectively).

Table 7.
ACCUMULATION OF COLLEGE CREDITS: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, total number of credits earned in the first year and through 2009, by remedial course enrollment and completion status: 2003–09

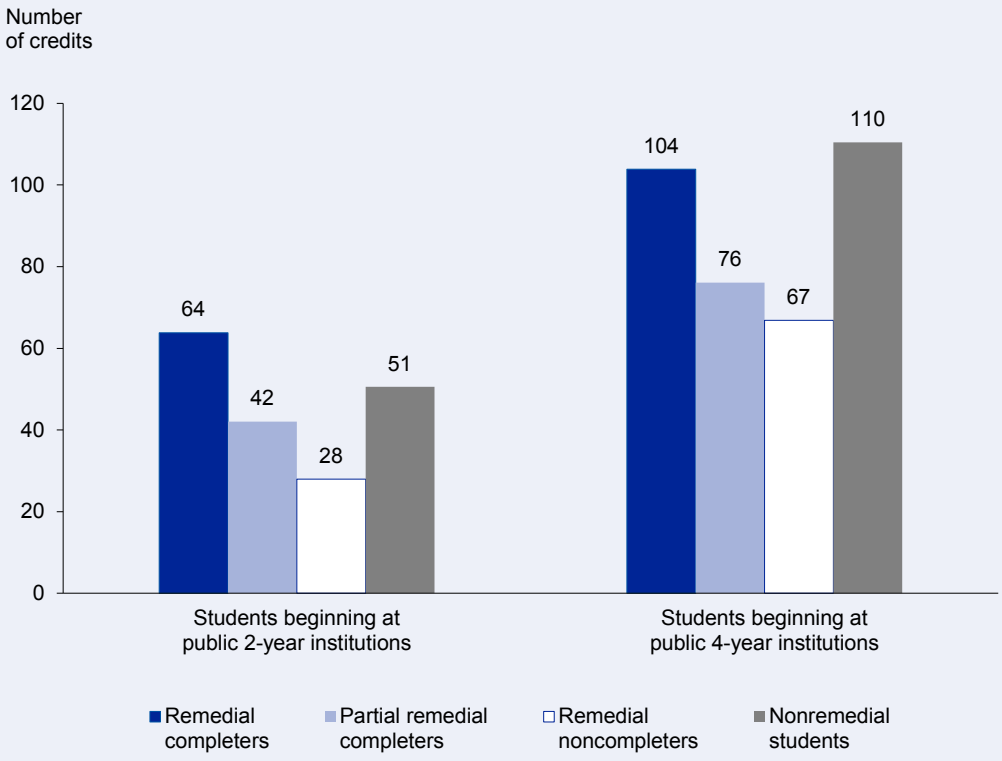
Remedial course enrollment and completion status	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Total credits earned in the first year	Total credits earned through 2009	Total credits earned in the first year	Total credits earned through 2009
Total	**16.4**	**54.4**	**25.1**	**104.3**
Enrolled in remedial courses	16.4	56.3	22.3	94.9
Completed all	20.1	70.0	25.3	108.4
Completed some	14.6	50.3	18.3	80.7
Completed none	9.0	28.2	17.6	67.2
Did not enroll in remedial course	16.5	50.6	27.0	110.5

NOTE: Credits earned in the first year and through 2009 may include remedial course credits, which are usually not counted toward degree completion. Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this table include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

While the total number of credits earned provides an overall picture of credit accumulation and perhaps a measure of how much effort students put into their studies, it does not necessarily reflect student progress toward degree completion. This is because the measure includes credits for remedial courses, which often do not count toward degree completion.[33] To provide an accurate picture of credits that count toward degree completion, figure 6 presents the number of credits that students earned only for college-level courses (i.e., excluding remedial course credits).

Figure 6.
COLLEGE-LEVEL COURSE CREDITS: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, average total number of college-level course credits earned through 2009, by remedial course enrollment and completion status: 2003–09



NOTE: College-level course credits do not include any remedial course credits. Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

[33] Remedial students may earn credits for remedial courses once they complete the courses. These credits sometimes count toward students' overall GPA, but they do not count toward graduation requirements (Parsad and Lewis 2003).

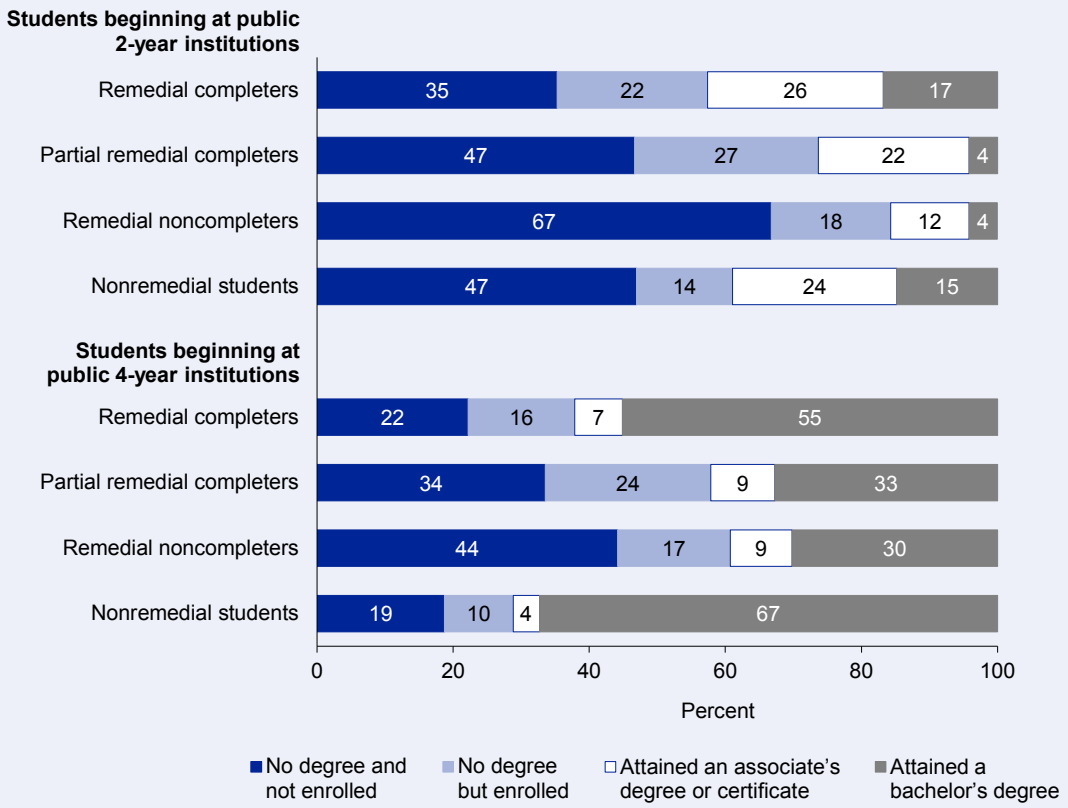
At both public 2- and 4-year institutions, remedial completers earned more college-level credits as of 2009 than partial completers and noncompleters. At public 2-year institutions, remedial completers had earned a total of 64 college-level credits through 2009, compared with the 42 and 28 credits earned by partial remedial completers and noncompleters, respectively. Remedial completers who began at public 4-year institutions had accumulated a total of 104 college-level credits by 2009, which was 28−37 credits more than what partial remedial completers and noncompleters had earned by 2009 (76 and 67 credits, respectively). Compared with nonremedial students, remedial completers who began at public 2-year institutions accumulated more total college-level credits through 2009 (64 credits vs. 51 credits), but those who began at public 4-year institutions earned fewer (104 credits vs. 110 credits).

Postsecondary Degree Attainment

By 2009, some 6 years after initial college entry, 55 percent of remedial completers who began at public 4-year institutions had earned a bachelor's degree (figure 7). Proportionally fewer partial remedial completers and noncompleters (33 and 30 percent, respectively) had reached this milestone by this time. Bachelor's degree attainment rates of these three remedial student groups (30−55 percent) were all lower than that of nonremedial students (67 percent). At the same time, proportionally more remedial completers and partial completers (16 percent and 24 percent, respectively) than nonremedial students (10 percent) were still enrolled in 2009, suggesting that remedial students may have taken longer to complete their undergraduate education.

At public 2-year institutions, remedial completers had better degree attainment outcomes than partial remedial completers and noncompleters. Six years after college entry, 17 percent of remedial completers, compared with 4 percent each for partial completers and noncompleters, had completed a bachelor's degree. About 26 percent of remedial completers, compared with 12 percent of noncompleters, earned an associate's degree or certificate. While there were no measurable differences between remedial completers and nonremedial students in their rates of degree attainment (17 and 15 percent earned a bachelor's degree and 26 and 24 percent earned an associate's degree or certificate), proportionally more remedial completers than nonremedial students were still enrolled in 2009 (22 percent vs. 14 percent), again reflecting that remedial students may take more time to attain their degree.

Figure 7.
SIX-YEAR PERSISTENCE AND ATTAINMENT: Among 2003–04 beginning postsecondary students who first enrolled in public 2- or 4-year institutions, percentage distribution of students according to their postsecondary persistence and highest degree attainment as of 2009, by remedial course enrollment and completion status: 2003–09



NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Detail may not sum to totals because of rounding. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

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Linking Remediation and Postsecondary Outcomes: A Multivariate Approach

Students who take remedial courses often possess a host of characteristics (e.g., lower ability, weaker skills) that are associated with their need for remediation, chance of completing remedial coursework, and eventual success in college. Because remedial and nonremedial students differ in several ways, simple comparisons of the outcomes of these two groups of students cannot accurately reflect the effectiveness of remediation. To estimate the potential benefits of remedial coursetaking, the biggest challenge is to isolate the effects of remediation from those of other factors (e.g., academic preparation) that influence remedial placement, completion, and the attainment of other outcomes. The most rigorous approach would employ an experimental design in which students with weak skills were randomly assigned either to a treatment group that receives remediation or to a control group that does not (Rutschow and Schneider 2011). This method would ensure that, before remediation, students in both groups were "equivalent" in every aspect (including measurable and unmeasurable characteristics), hence any subsequent differences in outcomes could be attributed to remedial intervention. Random assignment, though rigorous, is rarely used on a large scale due to its high costs and the ethical issues it poses.

In the absence of experimental designs, researchers have focused on quasi-experimental designs, using various statistical tools to attempt to create a comparison group that is very similar to the group of students who receive remediation and then control for any measurable differences between students who participate in remediation and students in the comparison group (Rutschow and Schneider 2011). Three major methods have been used so far to examine the effects of remediation, including regression discontinuity,[34]

[34] Regression discontinuity can be used when there is a cutoff point that reliably determines who gets assigned to a treatment or control group. In the case of college remediation, a cutoff point on the college placement test is selected to determine two groups of students: those who score just below the cutoff and therefore are placed into remediation and those who score just above the cutoff and therefore are not required to undergo remediation (Boatman and Long 2010; Calcagno and Long 2008; Martorell and McFarlin 2010; Scott-Clayton and Rodriguez 2012). The method assumes that the two samples of students on either side of the cutoff are essentially identical due to some randomness around the cutoff point. By comparing outcomes of these two groups, one can derive a reliable estimate of the effects of remediation. The main criticism of this method is that the results are limited to students on the margin of needing remediation and are not applicable to the weakest students.

propensity score matching,[35] and conventional regression models attempting to statistically control for any observed or measurable pre-existing characteristics. Results from quasi-experimental designs are not as widely generalizable as those from experimental designs because they usually cannot control for such unobserved or unmeasurable characteristics as motivation. Nevertheless, quasi-experimental approaches improve upon simple bivariate comparisons in terms of mitigating the problem of selection biases.

Although regression discontinuity and propensity score matching are the optimal approaches in evaluating the effects of college remediation in nonexperimental settings, these methods were not feasible for the current study for two reasons. First, BPS:04/09 lacks remedial placement test scores, which would be required for regression discontinuity analysis. Second, the sample of nonremedial students at public 2-year institutions (32 percent of all students) was too small to adequately match to remedial students (68 percent) for propensity score matching.[36] Therefore, this study used more conventional multivariate regressions—multinomial probit or negative binomial regression, depending on the outcome—to statistically control for observed characteristics in BPS:04/09 that are likely to be associated with remedial enrollment, completion, and postsecondary outcomes.[37]

Model Specifications

The bivariate results showed that, among remedial coursetakers, those who completed all the remedial courses they attempted were the most successful group. Remedial completers also compared equivalently or favorably to students who did not take any remedial courses. Overall, remedial noncompleters experienced the worst outcomes, and partial completers experienced mixed results.

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[35] The purpose of propensity score matching is to restrict the nonexperimental comparison group to a sample that is equivalent to the treatment group in terms of background characteristics (Rosenbaum and Rubin 1983). In the case of remediation, the method first uses a logistic regression to predict the probability (i.e., the "propensity score") of students being assigned to remediation given a set of observed covariates or preconditions (e.g., socioeconomic status, academic preparation). It then matches each remediated student who has a given propensity score with a student who has the closest propensity score but does not receive remediation (Attewell et al. 2006). One disadvantage of this method is that the propensity scores are based on observed covariates; unobservable characteristics that may affect assignment are unaccounted for in the matching process. Another disadvantage is that this method requires large samples and substantial overlaps between treatment and control groups in terms of propensity scores.

[36] Propensity score matching was attempted, but the results were not optimal in this study.

[37] An early study used both conventional regressions and propensity score matching to assess the impact of college remediation on various postsecondary outcomes and found that these two methods yielded similar results (Attewell et al. 2006).

Following up on these bivariate results, the multivariate regression analysis contrasted the three remedial groups' postsecondary outcomes with those of nonremedial students while simultaneously controlling for a wide range of characteristics that may be associated with remedial placement, completion, and other postsecondary outcomes. To provide a more refined analysis, remedial English/reading coursetaking was separated from remedial math coursetaking in all regressions. The results of this analysis helped determine whether students who succeeded or failed in remedial English/reading or math courses experienced better or worse outcomes than their nonremedial counterparts who had similar demographic and enrollment characteristics and academic preparation.

Outcome Variables. Six postsecondary outcomes were examined in the multivariate analysis: (1) earned any college-level English credits (1 = earned; 0 = did not earn), (2) earned any college-level math credits (1 = earned; 0 = did not earn), (3) left college without a degree or certificate during the first 2 years of enrollment (1 = left; 0 = persisted), (4) transferred to a 4-year institution (only for public 2-year college students) (1 = transferred; 0 = did not transfer), (5) the total number of college-level credits earned through 2009 (a count variable with positive integers or zero), and (6) persisted toward or attained a degree or certificate as of 2009 (2 = earned a degree/certificate; 1 = no degree/certificate but persisted in college; 0 = left college without a degree/certificate).

Key Independent Variables. The variables of interest in this study are students' enrollment and completion status in remedial English/reading and math courses. These two variables were categorized into four groups: enrolled in remedial English/reading (or math) courses and completed all of these courses; enrolled in remedial English/reading (or math) courses and completed some of these courses; enrolled in remedial English/reading (or math) courses and completed none of these courses; and did not enroll in any remedial English/reading (or math) courses. In all regressions, each remedial group was compared with its nonremedial counterparts. In other words, nonremedial students served as the comparison group in the analysis.

Control Variables. Remedial and nonremedial students differ in many respects, including demographic background, academic preparation, motivation and engagement, and the level of institution attended (Institute for Higher Education Policy 1998; Kurlaender and Howell 2012; Radford and Horn 2012). In BPS:04/09, proportionally more remedial students than nonremedial students at public 4-year institutions were Black or Hispanic or came from low-income backgrounds or families where parents had only a high school education or less (table 8). Compared with nonremedial students beginning at 4-year institutions, remedial students were also less prepared for college, enrolled in school part time more often, and had a

Table 8.
COMPARISON OF REMEDIAL AND NONREMEDIAL STUDENTS: Difference in selected characteristics between remedial and nonremedial students beginning at public 2- and 4-year institutions in 2003–04

Selected characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Remedial students	Nonremedial students	Remedial students	Nonremedial students
Female (%)	58.6	51.7	57.9	53.6
Black (%)[1]	16.1	9.4	15.6	5.3
Hispanic (%)[2]	17.2	12.2	13.0	7.7
Parents with a high school education or less (%)	42.8	40.5	30.3	17.1
Income level in the lowest 25 percent (%)[3]	28.0	19.4	25.9	15.8
Weakly prepared for college (%)[4]	29.6	20.6	18.4	3.7
Expected to complete a bachelor's degree (%)	39.1	35.8	29.1	23.6
Expected to complete a master's or higher degree (%)	45.1	40.1	68.2	75.4
Attended the first institution part time (%)	37.5	43.8	6.1	3.9
First-attended 4-year institution was least selective (%)[5]	†	†	28.7	13.3
Low-level academic integration in the first-attended institution (%)	36.3	38.9	16.2	11.3
Enrollment size of the first-attended institution	9,821	8,707	14,280	18,478
Percentage of minority students in the first-attended institution	33.9	30.8	29.8	23.2

† Not applicable.

[1] Black includes African American.

[2] Hispanic includes Latino.

[3] The total income in 2003–04 for independent students or parents of dependent students.

[4] This was derived from three precollege academic indicators: high school GPA, highest mathematics course taken in high school, and college admission test scores (ACT or SAT). See appendix A for a detailed construction of this variable.

[5] The selectivity of institution was developed only for public and private nonprofit 4-year institutions using the following criteria: whether the institution was open admission (had no minimal requirements); the number of applicants; the number of students admitted; the 25th and 75th percentiles of ACT and/or SAT scores; and whether test scores were required for admission. For more information, see Cunningham, A.F. (2006). *Changes in Patterns of Prices and Financial Aid* (NCES 2006-153). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

NOTE: "Remedial students" are students who enrolled in at least one remedial course from 2003 to 2009. "Nonremedial students" are students who did not enroll in any remedial courses from 2003 to 2009. Estimates in this table include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

lower level of academic integration in college (e.g., participation in study groups, interaction with faculty, or contact with academic advisors). Relatively fewer of them had an expectation of attaining a master's or other advanced degree. In addition, remedial students tended to enroll in larger 2-year institutions or smaller 4-year colleges, less selective colleges, or institutions with higher concentrations of minority students.[38] Research has shown that these characteristics are also linked to students' chances of completing remedial courses, moving on to college-level coursework, and eventually succeeding in college (Bailey, Jeong, and Cho 2010; Berkner and Choy

[38] Differences were observed at public 2-year institutions. In particular, proportionally more remedial students than nonremedial students were female, Black, or Hispanic; came from low-income backgrounds; and were less prepared for college (table 8). Proportionally fewer remedial students than their counterparts attended school part time, however.

2008; Crisp and Delgado 2014; Hagedorn, Cypers, and Lester 2008; Horn and Kojaku 2001; Mansfield and Farris 1991; McCormick 1999; Radford et al. 2010). Thus, the regression analysis below attempted to control for as many of these characteristics as available in BPS:04/09 when examining the association between remediation and postsecondary outcomes.

Specifically, the analysis included sex, race/ethnicity, parental education, and income level as demographic factors. Students' academic preparation, the most important determinant of remedial placement, was constructed from three precollege academic indicators: GPA in high school, the highest level math course taken in high school, and college admission test scores (ACT or SAT) (see appendix A for details). Students' initial educational expectations, enrollment intensity, and level of academic integration were included as proxies of student motivation and engagement[39] in postsecondary education. Besides separating students at public 2- and 4-year institutions, the regression analysis employed three additional institution variables to control for contextual factors that may be associated with college remediation: the size,[40] selectivity, and minority concentration of the first institution that students attended. Lastly, due to considerable variation in state policies on remedial education, the region (i.e., cluster of states) where the first-attended institution was located was also introduced into the regressions.[41] Detailed information on all these variables is provided in appendix A.

Interaction Terms. College remediation may not benefit all students in the same way. Boatman and Long (2010) found that remedial coursetaking benefited students with weaker skills but provided little help to those at the margin of needing remediation, suggesting that the impact of remediation differs according to students' level of preparation. To explore this interaction, all regression models in this study also included an interaction term between precollege academic preparation and remediation, examining whether the outcomes of remedial students are conditioned on the level of their academic preparation. A significant interaction would indicate that the association between remediation and an outcome differs by students' level of academic preparation.

Regression Models

Depending on the type of outcome variable (categorical or continuous), either a multinomial probit (MNP) regression or negative binomial (NB) regression was used. MNP is one of the statistical techniques commonly used when an outcome variable entails two or more mutually exclusive categories (e.g., transferred or did not transfer;

[39] Student motivation and engagement are difficult to measure and rarely covered in the national studies on postsecondary education, including BPS:04/09.
[40] Early studies found that remedial policies, support, and completion rates varied by institution size (Bailey, Jeong, and Cho 2010; Mansfield and Farris 1991).
[41] The BPS:04/09 sample was stratified by region, not state; therefore, state-level data are not representative.

attained a degree, no degree but enrolled, or no degree and not enrolled) (Borooah 2001; Koop 2008). The model estimates the predicted probability of attaining one outcome over several mutually exclusive alternatives. The results are often presented as average marginal effects, which measure the change in the predicted probability of observing an outcome when an independent variable changes by one unit while keeping all other variables in the model constant (Liao 1994).

NB is used when an outcome variable of interest is a count variable[42] (e.g., the total number of college-level credits that a student earned through 2009 in this study). This regression estimates the change in the predicted value of the outcome associated with a one-unit change in an independent variable while keeping all other variables constant in the model (Hilbe 2007).

In this study, all regression models were run separately for students beginning at public 2-year institutions and those beginning at public 4-year institutions. For the outcome of transferring to a 4-year institution, the model was only run for students beginning at public 2-year institutions. Detailed information on both MNP and NB regression models is provided in appendix B.

Reporting Multivariate Results

Because the primary focus of this study is remediation, the text below only discusses the regression results that are pertinent to remediation and its interaction with precollege academic preparation. For ease of interpretation, all multivariate-related tables are described by remediation's average marginal effects within each level of preparation. As a reminder, an average marginal effect represents the percentage point difference in the predicted probability of an outcome (or in the analysis of credits earned, the difference in the predicted count of college-level credits) between students with particular remediation status and their nonremedial counterparts. The regression results for all other independent variables (mainly serving as controls) are provided in appendix C. To ensure sufficient sample sizes, two levels of precollege academic preparation were used in the regression models: weak preparation and moderate/strong preparation.[43]

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[42] A count variable is a variable that takes on only positive integer values (1, 2 . . .) or zero, reflecting the number of occurrences of an event in a fixed period of time (Coxe, West, and Aiken 2009). In general, when a regression analysis involves a count outcome variable, Poisson regression (NB is one kind of Poisson regression model) is more appropriate than ordinary least squares (OLS) regression because OLS may produce biased standard errors and inappropriate significance tests due to violations of such OLS regression assumptions as constant variance and normal conditional distribution of error (Gardner, Mulvey, and Shaw 1995).

[43] Moderately and strongly prepared students were combined because the sample size for strongly prepared students taking remedial courses was relatively small (particularly at public 4-year institutions), making it difficult for MNP models to converge.

Is Participation in Remedial Courses Associated With Positive Postsecondary Outcomes? Insight From Multivariate Analysis

Earning College-Level English Credits

Public 2-Year Institutions. The bivariate analysis indicated that, at public 2-year institutions, proportionally more remedial English/reading completers than their nonremedial counterparts[44] earned college-level English credits (see table 4). Such a difference was not observed after controlling for various characteristics in the MNP regression model: remedial English/reading completers' probabilities of earning college-level English credits were comparable to those of their peers who did not take any remedial English/reading courses[45] (table 9).

Table 9.
REGRESSION ON EARNING COLLEGE-LEVEL ENGLISH CREDITS: Difference in the average predicted probability of earning any college-level English course credits between remedial English/reading completers, partial completers, and noncompleters and their nonremedial English/reading counterparts after controlling for various characteristics among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, by precollege academic preparation

	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
Comparison groups[1]	Weak academic preparation[2]	Moderate/ strong academic preparation[2]	Weak academic preparation[2]	Moderate/ strong academic preparation[2]
Remedial English/reading completers vs. nonremedial English/reading students	7.3	5.0	9.6 *	-0.5
Partial remedial English/reading completers vs. nonremedial English/reading students	-4.2	-30.2 *	-4.1	-9.9
Remedial English/reading noncompleters vs. nonremedial English/reading students	-17.0 *	-23.6 *	-31.5 *	-7.2

* $p < .05$

[1] Each row presents the difference in the predicted probability of obtaining an outcome between one particular group of remedial students and their nonremedial counterparts. For example, the estimate in the first cell of the third row (-17.0) shows that, among weakly prepared students beginning at public 2-year institutions, the predicted probability of earning any college-level English credits for remedial English/reading noncompleters is 17 percentage points lower than that for their counterparts without English/reading remediation. See table C-1 for complete regression results.

[2] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the regression model as an "unknown" category but not shown in this table. See appendix A for detailed construction of this variable.

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

[44] That is, students who did not take any remedial English/reading courses.

[45] The difference in the predicted probability of earning college-level English credits between remedial English/reading completers and their nonremedial counterparts was 7.3 percentage points for the weakly prepared group and 5.0 percentage points for the moderately/strongly prepared group, both of which were not significant (table 9).

Without any controls, proportionally fewer partial remedial English/reading completers at public 2-year institutions than their nonremedial counterparts earned college-level English credits (see table 4). After controlling for the effects of covariates, this remained true only for the moderately/strongly prepared group: the predicted probability of earning any college-level English credits for partial remedial English/reading completers was 30 percentage points lower than that for students without English/reading remediation. The difference, however, was not detected for the weakly prepared group.

Regardless of academic preparation, remedial English/reading noncompleters at public 2-year institutions had a lower probability of earning college-level English credits than their nonremedial counterparts; the gap was 17 percentage points for the weakly prepared group and 24 percentage points for the moderately/strongly prepared group.

Public 4-Year Institutions. Based on the bivariate results, at public 4-year institutions, the three remedial groups were no more or less likely than their nonremedial counterparts to earn college-level English credits (see table 4). After controlling for various factors in the MNP model, remedial English/reading completers with weak preparation had a higher probability (10 percentage points higher) than their nonremedial counterparts of earning such credits; conversely, remedial English/reading noncompleters with weak preparation had a lower probability (32 percentage points) of earning such credits than their nonremedial counterparts did (table 9). Group differences were not found among students with moderate/strong academic preparation.

Earning College-Level Math Credits

Public 2-Year Institutions. The bivariate analysis indicated that remedial math completers at public 2-year institutions were the most successful group in terms of earning college-level math credits, even surpassing students with no math remediation (see table 5). After controlling for various factors in the MNP analysis, only remedial math completers with weak preparation compared favorably with their nonremedial counterparts: remedial math completers' probability of earning college-level math courses was 21 percentage points higher than that of their nonremedial math counterparts (table 10). Among the moderate/strong preparation group, remedial math completers and their nonremedial counterparts had similar probabilities of earning college-level math credits.

Table 10.
REGRESSION ON EARNING COLLEGE-LEVEL MATH CREDITS: Difference in the average predicted probability of earning any college-level math course credits between remedial math completers, partial completers, and noncompleters and their nonremedial math counterparts after controlling for various characteristics among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, by precollege academic preparation

	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
Comparison groups[1]	Weak academic preparation[2]	Moderate/ strong academic preparation[2]	Weak academic preparation[2]	Moderate/ strong academic preparation[2]
Remedial math completers vs. nonremedial math students	20.7 *	2.9	18.6 *	-8.6 *
Partial remedial math completers vs. nonremedial math students	-4.8	-27.8 *	2.3	-15.7 *
Remedial math noncompleters vs. nonremedial math students	-22.9 *	-47.3 *	-16.7 *	-28.7 *

* $p < .05$

[1] Each row represents the difference in the predicted probability of obtaining an outcome between one particular group of remedial students and their nonremedial counterparts. For example, the estimate in the first cell of the first row (20.7) shows that, among weakly prepared students beginning at public 2-year institutions, the predicted probability of earning any college-level math credits for remedial math completers is 20.7 percentage points higher than that for their counterparts without math remediation. See table C-2 for complete regression results.

[2] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the regression model as an "unknown" category but not shown in this table. See appendix A for detailed construction of this variable.

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Differences between partial remedial math completers and nonremedial math students were measurable for the moderate/strong preparation group but not for the weak preparation group: partial remedial math completers with moderate/strong preparation had a lower probability of earning college-level math credits (28 percentage points lower) than their counterparts without math remediation did.

Overall, remedial math noncompleters had a lower probability of earning college-level math credits than their counterparts with no math remediation; the difference appeared larger for the moderate/strong preparation group (47 percentage points lower) than for the weak preparation group (23 percentage points lower).

Public 4-Year Institutions. The bivariate analysis found that none of the three remedial math groups at public 4-year institutions compared favorably with nonremedial students in terms of earning college-level math credits (see table 5). However, after controlling for various related factors in the MNP regression, remedial math completers with weak preparation surpassed their nonremedial counterparts in the probability of earning college-level math credits (19 percentage

points higher), while math completers with moderate/strong preparation still had a lower probability of earning college-level math credits than their nonremedial counterparts (9 percentage points lower) (table 10).

Among partial remedial completers at public 4-year institutions, a measurable difference was found for those with moderate/strong preparation but not for those with weak preparation: the probability of earning college-level math credits for partial remedial math completers with moderate/strong preparation was 16 percentage points lower than that for their counterparts with no math remediation. At the weak preparation level, no measurable difference was observed.

Regardless of the level of preparation, remedial math noncompleters' probability of earning college-level math credits was lower than that of nonremedial math students, but the difference tended to be larger for the moderate/strong preparation group (29 percentage points lower) than for the weak preparation group (17 percentage points lower).

Dropping Out of College by the End of the Second School Year

Public 2-Year Institutions. The bivariate results indicated that, compared with nonremedial students, proportionally fewer remedial completers but proportionally more remedial noncompleters left college without earning a credential by the end of the second year[46] (see figure 5). After controlling for related factors, the differences between remedial completers and their nonremedial counterparts largely disappeared at both preparation levels (table 11). For remedial noncompleters, a significant difference was found only for remedial math noncompleters with moderate/strong preparation: they had a higher probability of dropping out of college during the first 2 years than did their counterparts without math remediation (10 percentage points higher). At the weak preparation level, the two groups were not measurably different.

Public 4-Year Institutions. The pattern at public 4-year institutions largely reflected that at public 2-year institutions. Measurable differences were found for math remediation but not for English/reading remediation, suggesting that math remediation may have a stronger association with college attrition than English/reading remediation. Measurable differences also varied by academic preparation. Specifically, remedial math completers and partial remedial math completers with weak preparation had lower probabilities of dropping out of college during the first 2 years than their nonremedial counterparts (11 and 13 percentage points lower, respectively), but this positive result was not evident

[46] That is, leaving college without a degree or certificate by the end of the second year and not re-enrolling by the sixth year.

among those with moderate/strong preparation (table 11). Remedial math noncompleters at both academic preparation levels had a higher probability of leaving college by the end of the second year than their counterparts who did not take any remedial math courses (12 percentage points higher among the weakly prepared group and 11 percentage points higher among the moderately/strongly prepared group).

Table 11.
REGRESSION ON EARLY COLLEGE ATTRITION: Difference in the average predicted probability of leaving college without earning a degree or certificate by the end of the second academic year between remedial course completers, partial completers, and noncompleters and their nonremedial counterparts after controlling for various characteristics among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, by precollege academic preparation

	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
Comparison groups[1]	Weak academic preparation[2]	Moderate/ strong academic preparation[2]	Weak academic preparation[2]	Moderate/ strong academic preparation[2]
Remedial English/reading coursetaking				
Remedial English/reading completers vs. nonremedial English/reading students	-7.0	0.2	-2.4	-0.5
Partial remedial English/reading completers vs. nonremedial English/reading students	-7.5	10.2	-7.6	10.9
Remedial English/reading noncompleters vs. nonremedial English/reading students	11.7	9.0	-3.0	-3.1
Remedial math coursetaking				
Remedial math completers vs. nonremedial math students	-4.9	-3.7	-10.8 *	-1.4
Partial remedial math completers vs. nonremedial math students	-7.3 *	-2.2	-12.6 *	-0.6
Remedial math noncompleters vs. nonremedial math students	-4.3	10.1 *	11.7 *	11.4 *

* $p < .05$

[1] Each row represents the difference in the predicted probability of obtaining an outcome between one particular group of remedial students and their nonremedial counterparts. For example, the estimate in the first cell of the fifth row (-7.3) shows that, among weakly prepared students beginning at public 2-year institutions, the predicted probability of leaving college without earning a degree or certificate by the end of the second academic year for partial remedial math completers is 7.3 percentage points lower than that for their counterparts without math remediation. See table C-3 for complete regression results.

[2] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the regression model as an "unknown" category but not shown in this table. See appendix A for detailed construction of this variable.

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Transfer to a 4-Year Institution

This outcome was only applicable for students beginning at public 2-year institutions. Two transfer measures were examined in the MNP analysis: whether students made their first transfer to a 4-year institution and whether the institution students last attended through 2009 was a 4-year institution. The regression results for these two outcome variables were largely similar. Overall, the association of remediation with transfer varied by students' level of academic preparation (table 12). For example, among weakly prepared students, remedial English/reading completers had a similar probability of transferring to a 4-year institution as those without English/reading remediation. Among the moderately/strongly prepared group, however, remedial English/reading completers had a lower probability of transferring to a 4-year institution (8 percentage points lower) than their counterparts. This pattern was also observed for partial remedial completers: among the weakly prepared group, there was no significant difference in the probability of transferring to a 4-year institution between partial remedial English/reading completers and their nonremedial counterparts; among the moderately/strongly prepared group, however, partial remedial English/reading completers had a lower probability than their counterparts who had no English/reading remediation of transferring to a 4-year institution (16 percentage points lower).

Generally, regardless of students' academic preparation, remedial noncompleters were less likely than their counterparts without remediation to transfer to a 4-year institution. For example, among the weak preparation group, the probability of transferring to a 4-year institution for remedial English/reading noncompleters was 10 percentage points lower than that for students without English/reading remediation. Among the moderate/strong preparation group, the difference was 13 percentage points.

Table 12.
REGRESSION ON TRANSFER: Difference in the average predicted probability of first transferring to a 4-year institution or last enrolling in a 4-year institution between remedial course completers, partial completers, and noncompleters and their nonremedial counterparts after controlling for various characteristics among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, by precollege academic preparation

	First transfer was to a 4-year institution		Last institution attended was a 4-year institution	
Comparison groups[1]	Weak academic preparation[2]	Moderate/ strong academic preparation[2]	Weak academic preparation[2]	Moderate/ strong academic preparation[2]
Remedial English/reading coursetaking				
Remedial English/reading completers vs. nonremedial English/reading students	-1.2	-8.0 *	-0.7	-7.4 *
Partial remedial English/reading completers vs. nonremedial English/reading students	5.5	-16.1 *	1.0	-19.4 *
Remedial English/reading noncompleters vs. nonremedial English/reading students	-9.9 *	-12.8 *	-12.4 *	-13.6 *
Remedial math coursetaking				
Remedial math completers vs. nonremedial math students	0.8	-1.0	5.4	1.3
Partial remedial math completers vs. nonremedial math students	-4.8	-12.7 *	-0.6	-12.6 *
Remedial math noncompleters vs. nonremedial math students	-10.1 *	-10.9 *	-2.8	-10.9 *

* $p < .05$

[1] Each row represents the difference in the predicted probability of obtaining an outcome between one particular group of remedial students and their nonremedial counterparts. For example, the estimate in the first cell of the third row (-9.9) shows that, among weakly prepared students beginning at public 2-year institutions, the predicted probability of transferring to a 4-year institution for remedial English/reading noncompleters is 9.9 percentage points lower than that for their counterparts without English/reading remediation. See table C-4 for complete regression results.

[2] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the regression model as an "unknown" category but not shown in this table. See appendix A for detailed construction of this variable.

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Total Number of College-Level Credits Earned Through 2009

Public 2-Year Institutions. The bivariate analysis showed that remedial completers beginning at public 2-year institutions earned more total college-level credits through 2009 than nonremedial students did (see figure 6). After controlling for various factors in the multivariate analysis, this finding held only for remedial math completers with weak preparation: remedial math completers with weak preparation accumulated about 18 more college-level credits than did students who did not take any remedial math courses (table 13). No measurable difference was detected for the moderate/strong preparation group.

Table 13.
REGRESSION ON COLLEGE-LEVEL CREDITS: Difference in the predicted total number of college-level course credits earned through 2009 between remedial course completers, partial completers, and noncompleters and their nonremedial counterparts after controlling for various characteristics among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, by precollege academic preparation

	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
Comparison groups[1]	Weak academic preparation[2]	Moderate/ strong academic preparation[2]	Weak academic preparation[2]	Moderate/ strong academic preparation[2]
Remedial English/reading coursetaking				
Remedial English/reading completers vs. nonremedial English/reading students	4.1	-4.6	16.2	-8.1
Partial remedial English/reading completers vs. nonremedial English/reading students	0.4	-25.7 *	-18.7	-33.7 *
Remedial English/reading noncompleters vs. nonremedial English/reading students	-13.9 *	-20.1 *	-9.0	5.7
Remedial math coursetaking				
Remedial math completers vs. nonremedial math students	18.4 *	8.1	23.9 *	2.2
Partial remedial math completers vs. nonremedial math students	8.5	-9.4	12.8	-12.6
Remedial math noncompleters vs. nonremedial math students	-18.0 *	-26.5 *	-21.7	-39.5 *

* $p < .05$

[1] Each row represents the difference in the predicted total number of college-level credits earned through 2009 between one particular group of remedial students and their nonremedial counterparts. For example, the estimate in the first cell of the third row (-13.9) shows that among weakly prepared students beginning at public 2-year institutions, the predicted total number of college-level credits earned by remedial English/reading noncompleters is 13.9 credits lower than that for their counterparts without English/reading remediation. See table C-5 for complete regression results.

[2] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the regression model as an "unknown" category but not shown in this table. See appendix A for detailed construction of this variable.

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

The bivariate results showed that partial remedial completers earned fewer college-level credits than nonremedial students did. Controlling for covariates, this finding held only for partial remedial English/reading completers with moderate/strong preparation: they earned about 26 fewer college-level credits through 2009 than their counterparts with moderate/strong preparation but no English/reading remediation. No measurable difference was detected for the weak preparation group.

Overall, remedial English/reading and math noncompleters at both preparation levels earned fewer credits than their nonremedial counterparts did. For example, remedial math noncompleters with weak preparation earned 18 fewer credits than

did students with weak preparation who had not taken remedial math courses. For remedial math noncompleters with moderate/strong preparation, the difference was 27 credits.

Public 4-Year Institutions. At public 4-year institutions, differences between remedial completers and nonremedial students were mainly observed for math remediation. Specifically, remedial math completers with weak preparation earned about 24 more college-level credits than did students who did not take any remedial math courses (table 13). This positive outcome, however, was not observed among students with moderate/strong preparation.

Bivariate results indicated that partial remedial completers earned fewer college-level credits than nonremedial students did. In the multivariate analysis, this difference was only observed among students with moderate/strong preparation: partial remedial English/reading completers earned about 34 fewer college-level credits through 2009 than did their counterparts without English/reading remediation. No measurable difference was detected for the weak preparation group.

Although the bivariate analysis showed that remedial noncompleters earned fewer college-level credits than their nonremedial counterparts, in the multivariate analysis the difference was only observed for math remediation among the moderately/strongly prepared group. Remedial math noncompleters with moderate/strong preparation earned about 40 fewer credits than did moderately/strongly prepared students without math remediation; the difference among the weakly prepared group was not significant however.

Highest Degree Attainment and Persistence Status

Public 2-Year Institutions. The bivariate analysis showed that, compared with nonremedial students, remedial completers beginning at public 2-year institutions completed a degree or persisted for 6 years at higher rates (see figure 7). These differences largely disappeared after controlling for various characteristics in the MNP models (table 14).[47]

[47] One exception is that remedial math completers with moderate/strong academic preparation had a higher probability of persisting in college than their counterparts without math remediation (7 percentage points higher).

Table 14.
REGRESSION ON 6-YEAR PERSISTENCE AND ATTAINMENT: Difference in the average predicted probability of persisting or earning a degree or certificate as of 2009 between remedial completers, partial completers, and noncompleters and their nonremedial counterparts after controlling for various characteristics among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, by precollege academic preparation

	Did not attain a degree but were still enrolled		Attained an associate's degree or certificate[1]		Attained a bachelor's degree[1]	
Comparison groups[2]	Weak academic preparation[3]	Moderate/ strong academic preparation[3]	Weak academic preparation[3]	Moderate/ strong academic preparation[3]	Weak academic preparation[3]	Moderate/ strong academic preparation[3]
Students beginning at public 2-year institution						
Remedial English/reading coursetaking						
Remedial English/reading completers vs. nonremedial English/reading students	2.0	2.7	2.6	3.0	-0.5	-2.1
Partial remedial English/reading completers vs. nonremedial English/reading students	10.2	-2.6	-2.9	1.4	-3.3	-10.4 *
Remedial English/reading noncompleters vs. nonremedial English/reading students	-8.1	3.3	-11.1 *	4.8	-4.4	-5.9
Remedial math coursetaking						
Remedial math completers vs. nonremedial math students	0.8	6.7 *	3.8	1.4	2.9	-0.6
Partial remedial math completers vs. nonremedial math students	3.0	11.6 *	8.5 *	-0.2	-4.5 *	-14.4 *
Remedial math noncompleters vs. nonremedial math students	-0.8	8.0	-4.2	-15.7 *	-6.5 *	-13.1 *
Students beginning at public 4-year institution[4]						
Remedial completers vs. nonremedial students	-5.3	2.4	2.0	2.7 *	20.6 *	-5.1 *
Partial remedial completers vs. nonremedial students	0.8	9.2 *	-1.1	4.8 *	14.7	-21.0 *
Remedial noncompleters vs. nonremedial students	-3.7	5.5	7.0	4.4	-11.5	-27.5 *

* $p < .05$

[1] Highest degree attainment as of 2009.

[2] Each row represents the difference in the predicted probability of obtaining an outcome between one particular group of remedial students and nonremedial students. For example, the last cell in the last row (-27.5) shows that, among moderately/strongly prepared students beginning at public 4-year institutions, the predicted probability of attaining a bachelor's degree for remedial noncompleters is 27.5 percentage points lower than that for their counterparts who did not take any remedial courses. See tables C-6 and C-7 for complete regression results.

[3] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the regression model as an "unknown" category but not shown in this table. See appendix A for a detailed construction of this variable.

[4] The MNP model for public 4-year institutions cannot be converged if the effects of remedial English/reading and math course completion status were estimated separately. Therefore, the model estimated the effects of completion of remedial courses in any fields as opposed to in English/reading and math.

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this table include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

The MNP results showed that more differences between partial remedial completers and nonremedial students emerged for math remediation than for English/reading remediation. Compared with students without math remediation, partial remedial math completers at both academic preparation levels had a lower probability of earning a bachelor's degree—5 percentage points lower among the weak preparation group and 14 percentage points lower among the moderate/strong preparation group. However, partial remedial math completers with weak preparation were more likely than weakly prepared nonremedial students to earn an associate's degree (9 percentage points higher), and those with moderate/strong preparation were more likely than their counterparts who did not take any remedial math courses to stay enrolled (12 percentage points higher).

Comparing remedial noncompleters to nonremedial students, group differences were also found mostly in math remediation: remedial math noncompleters generally had lower probabilities of earning an associate's degree/certificate or a bachelor's degree than their counterparts without math remediation did, but the gap for the moderate/strong preparation group was almost twice the gap for the weak preparation group (13 percentage points difference vs. 7 percentage points difference for bachelor's degree attainment).

Public 4-Year Institutions. Among those beginning at public 4-year institutions, the bivariate analysis showed that proportionally fewer remedial completers than nonremedial students had earned a bachelor's degree by 2009 (see figure 7). After controlling for related characteristics in the MNP analysis,[48] remedial completers with weak academic preparation had a higher probability (21 percentage points higher) than their counterparts with no remedial math courses of earning a bachelor's degree by 2009 (table 14). However, remedial completers with moderate/strong preparation were 5 percentage points less likely than their nonremedial counterparts to earn a bachelor's degree by 2009.

The degree attainment pattern for both partial remedial completers and noncompleters was similar: at the moderate/strong preparation level, both groups had lower probabilities of earning a bachelor's degree than nonremedial students (21 and 28 percentage points lower, respectively), but there was no statistically significant difference at the weak preparation level.

[48] Remedial English/reading and math cannot be examined separately because of the difficulty in converging the MNP regression model for public 4-year institutions.

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Summary

College remediation is a widespread practice in U.S. public higher education. Every year, millions of students arrive on campus without adequate preparation and are required to take remedial courses before they move on to college-level coursework. Nationally representative data from BPS:04/09 indicate that nearly 70 percent of students beginning at public 2-year institutions and 40 percent of those beginning at public 4-year institutions took at least one remedial course during their undergraduate careers.

The intensity of remediation was particularly evident at public 2-year colleges. BPS data indicate that 48 percent of incoming students at public 2-year institutions (vs. 21 percent of those at public 4-year institutions) took at least two remedial courses, and 26 percent (vs. 9 percent at public 4-year institutions) were enrolled in remedial courses across multiple subjects. Overall, remedial coursetakers beginning at public 2-year institutions took an average of three remedial courses, compared with an average of two courses taken by those beginning at public 4-year institutions.

While remediation was concentrated among weakly prepared students, not all students with weak preparation took remedial courses, and conversely, a substantial share of strongly prepared students also took remedial courses. The latter may reflect institutions' varying policies on remedial education and definitions of college readiness. Many students who enrolled in remedial courses did not complete them. At public 2-year institutions, about half of remedial coursetakers (49 percent) completed all the remedial courses they attempted, compared with 59 percent of those at public 4-year institutions. Overall, 15–16 percent of remedial coursetakers at both levels did not complete any of the remedial courses they attempted.

Findings from the bivariate analysis suggested that remedial completers experienced better outcomes than did partial remedial completers and noncompleters in terms of enrolling in college-level English and math courses, transferring to a 4-year institution, persisting in college, accumulating credits that counted toward a credential, and attaining a postsecondary degree. They even outperformed nonremedial students in some areas. Students who enrolled in remedial courses but did not complete any of these courses experienced the worst outcomes, while those who completed some but not all of the remedial courses in which they enrolled had mixed results.

The multivariate analysis suggested that the positive associations between remedial completion and various outcomes were apparent among weakly prepared students but not among moderately or strongly prepared students. Among those who were weakly prepared, for example, remedial math completers surpassed their counterparts who took no remedial math courses on many outcomes even after controlling for related characteristics: they were more likely to earn college-level math credits (at both types of institutions), were less likely to drop out of college (among those beginning at public 4-year institutions), and accumulated more college-level credits as of 2009 (at both types of institutions). Likewise, at public 4-year institutions, remedial English completers with weak preparation were more likely than their counterparts without English/reading remediation to earn college-level English credits and to earn a bachelor's degree. At both public 2- and 4-year institutions, remedial math completers with weak preparation earned more college-level credits than their comparable peers without math remediation did. These advantages for remedial completers, however, did not hold among students with moderate/strong preparation.

Overall, remedial noncompleters generally lagged behind their nonremedial counterparts on all outcomes, and those with moderate/strong preparation exhibited the lowest probabilities of success after controlling for various factors. For instance, at public 2-year institutions, remedial English/reading noncompleters at both preparation levels were less likely than nonremedial English/reading students to earn college-level English credits, but the gap was 17 percentage points among weakly prepared students and 24 percentage points for moderately/strongly prepared students. Also at public 2-year institutions, remedial math noncompleters generally had a lower probability of earning college-level math credits than nonremedial math students, but the difference appeared to be larger for those with moderate/strong preparation (47 percentage points lower) than for those with weak preparation (23 percentage points lower). Among both weakly and moderately/strongly prepared students who began at public 2-year institutions, remedial math noncompleters earned fewer college-level credits than nonremedial math students did, but the gap tended to be wider among the moderately/strongly prepared (27 fewer credits) than among the weakly prepared (18 fewer credits). At public 4-year institutions, remedial noncompleters with weak preparation were no more or less likely than their nonremedial counterparts to earn a bachelor's degree. Among the moderately/strongly prepared, however, remedial noncompleters were 28 percentage points less likely than their counterparts without remediation to earn a bachelor's degree.

In sum, the relationship between students' participation in and completion of remedial coursework and their subsequent college outcomes varied with their level of

academic preparation. Weakly prepared beginning postsecondary students who enrolled in remedial English/reading and math courses and completed all of these courses experienced better outcomes relative to their counterparts who did not enroll in these remedial courses. This positive association, however, did not hold for remedial completers with moderate/strong preparation. In most cases, remedial completers and nonremedial students with moderate/strong preparation experienced similar outcomes.

Students who enrolled in but failed to complete remedial courses experienced worse outcomes than did their counterparts who had similar backgrounds but did not take remedial courses. Holding students' demographic and enrollment characteristics constant, remedial noncompleters, especially those with moderate/strong preparation, were less likely to move on to college-level courses, persist through college, transfer to a 4-year institution, earn sufficient credits toward graduation, or attain a bachelor's degree within 6 years than their counterparts who did not take remedial courses.

Given the different outcomes experienced by remedial completers and noncompleters, further research is needed to identify the underlying obstacles that hinder remedial course completion. Understanding the major obstacles can help colleges and universities better identify struggling students, design strategies to help them overcome their hurdles, and make remedial programs more effective in retaining students and enabling them to progress to college-level curricula and beyond.

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References

Adelman, C. (2004). *Principal Indicators of Student Academic Histories in Postsecondary Education, 1972–2000*. Washington, DC: U.S. Department of Education.

Adelman, C. (2006). *The Toolbox Revisited: Paths to Degree Completion From High School Through College*. Washington, DC: U.S. Department of Education.

Attewell, P.A., Lavin, D.E., Domina, T., and Levey, T. (2006). New Evidence on College Remediation. *Journal of Higher Education*, *77*(5): 886−924.

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

Bahr, P.R. (2010). Revising the Efficacy of Postsecondary Remediation: The Moderating Effects of Depth/Breadth of Deficiency. *Review of Higher Education, 33*(2): 177−205.

Bailey, T. (2009). Challenge and Opportunity: Rethinking the Role and Function of Developmental Education in Community College. *New Directions for Community Colleges, 145*: 11−30.

Bailey, T., and Cho, S. (2010). *Developmental Education in Community Colleges. Prepared for: The White House Summit on Community College*. New York: Community College Research Center, Teachers College, Columbia University. Retrieved February 3, 2014, from http://www2.ed.gov/PDFDocs/college-completion/07-developmental-education-in-community-colleges.pdf.

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

Berkner, L., and Choy, S. (2008). *Descriptive Summary of 2003–04 Beginning Postsecondary Students: Three Years Later* (NCES 2008-174). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Bettinger, E.P., and Long, B.T. (2005). *Addressing the Needs of Underprepared Students in Higher Education: Does College Remediation Work?* NBER Working Paper No. 11325. Cambridge, MA: National Bureau of Economic Research (NBER).

Bettinger, E.P., and Long, B.T. (2007). Institutional Responses to Reduce Inequalities in College Outcomes: Remedial and Developmental Courses in Higher Education. In S. Dickert-Conlin and R. Rubenstein (Eds.), *Economic Inequality and Higher Education: Access, Persistence, and Success* (pp. 69–100). New York: Russell Sage Foundation.

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

Boatman, A., and Long, B.T. (2010). *Does Remediation Work for All Students? How the Effects of Postsecondary Remedial and Developmental Courses Vary by Level of Academic Preparation.* New York: National Center for Postsecondary Research, Teachers College, Columbia University.

Bobo, A., Duncan, C., Goodman, C., Harris, J., Jarvis, S., Kombos, T., McDaniel, T., Prescott, J.A., Rapini, S., Shafer, J., Xing, S., and Zhang, H. (2013). *Does Developmental Education Meet Student Needs?* Bryan, TX: The Greater Texas Foundation. Retrieved April 20, 2016, from http://oaktrust.library.tamu.edu/handle/1969.1/151992.

Borooah, V.K. (2001). *Logit and Probit: Ordered and Multinomial Models.* Sage University Papers Series on Quantitative Applications in the Social Sciences (07-138). Thousand Oaks, CA: Sage.

Breneman, D., and Haarlow, W. (1998). *Remedial Education: Costs and Consequences.* Washington, DC: Thomas B. Fordham Foundation.

Bryan, M. (2012). *2010 College Course Map* (NCES 2012-162rev). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Calcagno, J.C., and Long, B.T. (2008). *The Impact of Postsecondary Remediation Using a Regression Discontinuity Approach: Addressing Endogenous Sorting and Noncompliance.* NBER Working Paper No. 14194. Cambridge, MA: National Bureau of Economic Research (NBER).

Cameron, C., and Trivedi, P.K. (2013). *Regression Analysis of Count Data* (2nd edition). Econometric Society Monograph No. 53. Cambridge, UK: Cambridge University Press.

Cohen, J., and Cohen, P. (1983). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. Hillsdale, NJ: Erlbaum.

Cominole, M., Siegel, P., Dudley, K., Roe, D., and Gilligan, T. (2006). *2004 National Postsecondary Student Aid Study (NPSAS:04) Full-scale Methodology Report* (NCES 2006-180). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Complete College America. (2012). *Remediation: Higher Education's Bridge to Nowhere*. Washington, DC: Author. Retrieved February 3, 2014, from http://www.completecollege.org/docs/CCA-Remediation-final.pdf.

Coxe, S., West, S.G., and Aiken, L.S. (2009). The Analysis of Count Data: A Gentle Introduction to Poisson Regression and Its Alternatives. *Journal of Personality Assessment, 91*(2): 121–136.

Crisp, G., and Delgado, C. (2014). The Impact of Developmental Education on Community College Persistence and Vertical Transfer. *Community College Review, 42*(2): 99–117.

Cunningham, A.F. (2006). *Changes in Patterns of Prices and Financial Aid* (NCES 2006-153). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Fain, P. (2013). Going to the Root of the Problem. *Inside Higher Ed*. Retrieved August 1, 2014, from http://www.insidehighered.com/news/2013/09/13/promising-remedial-math-reform-tennessee-expands.

Deil-Amen, R., and Rosenbaum, J. (2002). The Unintended Consequences of Stigma-Free Remediation. *Sociology of Education, 75*(3): 249−268.

Dillon, E.W., and Smith, J.A. (2013). *The Determinants of Mismatch Between Students and Colleges*. NBER Working Paper No. 19286. Cambridge, MA: National Bureau of Economic Research (NBER).

Gardner, W., Mulvey, E.P., and Shaw, E.C. (1995). Regression Analyses of Counts and Rates: Poisson, Overdispersed Poisson, and Negative Binomial Models. *Psychological Bulletin, 118*(3): 392–404.

Government Accountability Office (GAO). (2013). *Community Colleges: New Federal Research Center May Enhance Current Understanding of Developmental Education* (GAO-13-656). Washington, DC: Author. Retrieved February 3, 2014, from http://www.gao.gov/assets/660/657683.pdf.

Greene, J.P., and Winters, M.A. (2005). *Public High School Graduation and College-Readiness Rates: 1991–2002*. New York: Manhattan Institute for Policy Research, Center for Civic Innovation. Retrieved April 26, 2016, from http://www.manhattan-institute.org/pdf/ewp_08.pdf.

Hagedorn, L.S., Cypers, S., and Lester, J. (2008). Looking in the Review Mirror: Factors Affecting Transfer for Urban Community College Students. *Community College Journal of Research and Practice, 33*(9): 643−664.

Hassel, H., and Giordano, J.B. (2015). The Blurry Borders of College Writing: Remediation and the Assessment of Student Readiness. *College English, 78*(1): 56−80.

Hilbe, J.M. (2007). *Negative Binomial Regression*. New York: Cambridge.

Horn, L., and Kojaku, L.K. (2001). *High School Academic Curriculum and the Persistence Path Through College* (NCES 2001-163). National Center for Education Statistics, U.S. Department of Education. Washington, DC.

Hughes, K.L., and Scott-Clayton, J. (2011). Assessing Developmental Assessment in Community Colleges. *Community College Review, 39*(4): 327–351.

Inside Higher Ed. (2012). *Connecticut Legislature Passes Remedial Education Overhaul.* Retrieved August 1, 2014, from http://www.insidehighered.com/quicktakes/2012/05/07/connecticut-legislature-passes-remedial-education-overhaul.

The Institute for Higher Education Policy. (1998). *College Remediation: What It Is. What It Costs. What's At Stake*. Washington, DC: Author. Retrieved February 3, 2014, from http://www.ihep.org/assets/files/publications/a-f/CollegeRemediation.pdf.

Koop, G. (2008). *Introduction to Econometrics*. New York: John Wiley & Sons.

Kurlaender, M., and Howell, J.S. (2012). *Collegiate Remediation: A Review of the Causes and Consequences*. New York: College Board Advocacy & Policy Center. Retrieved February 3, 2014, from https://research.collegeboard.org/sites/default/files/publications/2014/9/collegiate-remediation-review-causes-consequences.pdf.

Lesik, S. (2006). Applying the Regression-Discontinuity Design to Infer Causality With Nonrandom Assignment. *Review of Higher Education, 30*(1): 1−19.

Levesque, K., Laird, J., Hensley, E., Choy, S.P., Cataldi, E.F., and Hudson, L. (2008). *Career and Technical Education in the United States: 1990 to 2005* (NCES 2008-035). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Levin, H.M., and Calcagno, J.C. (2008). Remediation in the Community College: An Evaluator's Perspective. *Community College Review, 35*(3): 181−207.

Lewis, L., and Farris, E. (1996). *Remedial Education at Higher Education Institutions in Fall 1995* (NCES 97-584). National Center for Education Statistics, U.S. Department of Education. Washington, DC.

Liao, T.F. (1994). *Interpreting Probability Models: Logit, Probit, and Other Generalized Linear Models*. Sage University Papers Series on Quantitative Applications in the Social Sciences (07-138). Thousand Oaks, CA: Sage.

MacArthur, C.A., Philippakos, Z.A., and Graham, S. (2015). A Multicomponent Measure of Writing Motivation With Basic College Writers. *Learning Disability Quarterly, 39*(1): 31–43.

Mansfield, W., and Farris, E. (1991). *College-Level Remedial Education in the Fall of 1989* (NCES 91-191). National Center for Education Statistics, Office of Educational Research and Improvement, U.S. Department of Education. Washington, DC.

Martorell, P., and McFarlin, I. (2010). Help or Hindrance? The Effects of College Remediation on Academic and Labor Market Outcomes. *Review of Economics and Statistics, 93*(2): 436–454.

McCormick, A.C. (1999). *Credit Production and Progress Toward the Bachelor's Degree: An Analysis of Postsecondary Transcripts for Beginning Students at 4-Year Institutions* (NCES 1999-057). National Center for Education Statistics, U.S. Department of Education. Washington, DC.

Merisotis, J., and Phipps, R. (2000). Remedial Education in Colleges and Universities: What's Really Going On? *The Review of Higher Education, 24*(1): 67–85.

National Center on Education and the Economy. (2013). *What Does It Really Mean to Be College and Work Ready? The Mathematics and English Literacy Required of First Year Community College Students.* Washington, DC: Author. Retrieved April 19, 2016, from http://www.ncee.org/wp-content/uploads/2013/05/NCEE_ExecutiveSummary_May2013.pdf.

Parsad, B., and Lewis, L. (2003). *Remedial Education at Degree Granting Postsecondary Institutions in Fall 2000* (NCES 2004-010). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Radford, A.W., Berkner, L., Wheeless, S.C., and Shepherd, B. (2010). *Persistence and Attainment of 2003−04 Beginning Postsecondary Students: After 6 Years* (NCES 2011-151). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Radford, A.W., and Horn, L. (2012). *Web Tables—An Overview of Classes Taken and Credits Earned by Beginning Postsecondary Students* (NCES 2013-151REV). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Roderick, M., Nagaoka, J., and Coca, V. (2009). College Readiness for All: The Challenge for Urban High Schools. *Future of Children, 19*(1): 185–210.

Rosenbaum, J.E. (2001). *Beyond College for All.* New York: Russell Sage Foundation.

Rosenbaum, J.E., Deil-Amen, R., and Person, A.E. (2009). *After Admission: From College Access to College Success.* New York: Russell Sage Foundation.

Rosenbaum, P.R., and Rubin, D. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika, 70*(1): 41–55.

Rutschow, E.Z., and Schneider, E. (2011). *Unlocking the Gate: What We Know About Improving Developmental Education.* New York: MDRC. Retrieved February 3, 2014, from http://www.mdrc.org/sites/default/files/full_595.pdf.

Scott-Clayton, J., and Rodriguez, O. (2012). *Development, Discouragement, or Diversion? New Evidence on the Effects of College Remediation.* NBER Working Paper No. 18328. Cambridge, MA: National Bureau of Economic Research (NBER).

Seastrom, M.M. (2014). *NCES Statistical Standards* (NCES 2014-097). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Skomsvold, P. (2014). *Profile of Undergraduate Students: 2011–12* (NCES 2015-167). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Skomsvold, P., Radford, A.W., and Berkner, L. (2011). *Six-Year Attainment, Persistence, Transfer, Retention, and Withdrawal Rates of Students Who Began Postsecondary Education in 2003–04* (NCES 2011-152). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Snyder, T.D., and Dillow, S.A. (2012). *Digest of Education Statistics, 2011* (NCES 2012-001). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Sparks, D., and Malkus, N. (2013). *First-Year Undergraduate Remedial Coursetaking: 1999–2000, 2003–04, 2007–08* (NCES 2013-013). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Strong American Schools. (2008). *Diploma to Nowhere*. Washington, DC: Author. Retrieved August 11, 2013, from http://paworldclassmath.webs.com/8534051-Diploma-To-Nowhere-Strong-American-Schools-2008.pdf.

Wine, J., Janson, N., and Wheeless, S. (2011). *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) Full-scale Methodology Report* (NCES 2012-246). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

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Appendix A—Glossary

This glossary describes the variables used in this study. These variables were either taken directly from the restricted data files for the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) or derived from variables in the restricted data files. In the glossary below, the items are listed in alphabetical order by the variable label. The name of each variable appears to the right of the variable label.

Glossary Index

Glossary Index—continued

Variable Label	Variable Name
Region of institution first attended in 2003−04	OBEREG
Remedial coursetaking across multiple subjects	REMECRS
Selectivity of first-attended 4-year institution	SELECTV2
Sex	GENDER
Size of institution first attended in 2003−04	ENRLSIZE
Student age in 2003−04	AGEGROUP
Study weight	WTD000
Total number of credits earned in the first year of enrollment	QE1STERN
Total number of credits earned through 2009	TOTCRDT
Total number of college-level credits earned through 2009	COLLCRDT

POWERSTATS VARIABLE

Academic integration in 2003–04 **ACAINX04**

Indicates student's level of academic integration during the first academic year. This variable was derived from the average of the responses indicating how often the student participated in study groups (FREQ04A), had social contact with faculty (FREQ04B), met with an academic advisor (FREQ04C), and talked with faculty about academic matters (FREQ04D). The resulting average was recoded into the following three levels:

Low integration (0–0.25)
Moderate integration (>0.25–1)
High integration (>1)

Completion status of remedial courses in any field **PASSTOTR**

Indicates remedial course enrollment and completion status based on students' transcripts. This variable was derived from the total number of remedial courses taken (QETOTR) and the total number of remedial courses that were taken and passed (QEPASR). Appendix D provides a detailed list of remedial courses. Students who took any course in the list are considered remedial coursetakers. These students were further classified based on the number of remedial courses completed.

Did not take any remedial course
Took and passed all
Took and passed some
Took and passed none

Completion status of remedial English/reading courses **PASSRER**

Indicates remedial English/reading course enrollment and completion status based on students' transcripts. This variable was derived from the total number of remedial English and reading courses taken (QEENGR and QEREADR) and the total number of remedial English and reading courses that were taken and passed (QEPASENR and QEPASRER). Appendix D provides a detailed list of remedial English/reading courses. Students who took any course in the list are considered remedial English/reading coursetakers. These students were further classified based on the number of remedial English/reading courses completed.

Did not take any remedial English/reading course
Took and passed all
Took and passed some
Took and passed none

Completion status of remedial math courses **PASSRMTH**

Indicates remedial math course enrollment and completion status based on students' transcripts. This variable was derived from the total number of remedial math courses taken (QEMATHR) and the total number of remedial math courses that were taken and passed (QEPASMAR). Appendix D provides a detailed list of remedial math courses. Students who took any course in the list are considered remedial math coursetakers. These students were further classified based on the number of remedial math courses completed.

Did not take any remedial math course
Took and passed all
Took and passed some
Took and passed none

POWERSTATS VARIABLE

Cumulative postsecondary persistence by the end of academic year 2003−04 **PROUT1**
Indicates the cumulative outcome of postsecondary enrollment through the end of the 2003−04 academic year (within the first year of entering postsecondary education). The variable was recoded into two categories:

Left without a degree or certificate and had not returned as of 2009
Attained a degree or persisted in postsecondary education

Cumulative postsecondary persistence by the end of academic year 2004−05 **PROUT2**
Indicates the cumulative outcome of postsecondary enrollment through the end of the 2004−05 academic year (within 2 years of entering postsecondary education). The variable was recoded into two categories:

Left without a degree or certificate and had not returned as of 2009
Attained a degree or persisted in postsecondary education

Cumulative postsecondary persistence by the end of academic year 2005−06 **PROUT3**
Indicates the cumulative outcome of postsecondary enrollment through the end of the 2005−06 academic year (within 3 years of entering postsecondary education). The variable was recoded into two categories:

Left without a degree or certificate and had not returned as of 2009
Attained a degree or persisted in postsecondary education

Cumulative postsecondary persistence by the end of academic year 2006−07 **PROUT4**
Indicates the cumulative outcome of postsecondary enrollment through the end of the 2006−07 academic year (within 4 years of entering postsecondary education). The variable was recoded into two categories:

Left without a degree or certificate and had not returned as of 2009
Attained a degree or persisted in postsecondary education

Cumulative postsecondary persistence by the end of academic year 2007−08 **PROUT5**
Indicates the cumulative outcome of postsecondary enrollment through the end of the 2007−08 academic year (within 5 years of entering postsecondary education). The variable was recoded into two categories:

Left without a degree or certificate and had not returned as of 2009
Attained a degree or persisted in postsecondary education

Cumulative postsecondary persistence by the end of academic year 2008−09 **PROUT6**
Indicates the cumulative outcome of postsecondary enrollment through the end of the 2008−09 academic year (within 6 years of entering college). The variable was recoded into two or four categories for various analyses of persistence and attainment status in this study:

Two categories:
- Left without a degree or certificate
- Attained a degree or persisted in postsecondary education

Four categories:
- Attained a bachelor's degree
- Attained an Associate's degree/certificate
- Did not attain a degree/certificate but was still enrolled
- Left without a degree/certificate

Earned any credits in college-level English courses **ERNENG**

Indicates whether a student earned any credits in college-level English courses through 2009 based on students' transcripts. This variable was derived from the PETS course code (MTPETC),[49] potential course credit (MTPOTCR), and grade received for the course (MTNGRAD). Appendix D provides a detailed list of college-level English courses. Students who took a credit-bearing college-level English course on this list and received a valid grade for or passed the course were considered to have earned credits in college-level English courses. This variable has two categories:

Earned
Did not earn

Earned any credits in college-level math courses **ERNMATH**

Indicates whether a student earned any credits in college-level math courses through 2009 based on students' transcripts. This variable was derived from the PETS course code (MTPETC), potential course credit (MTPOTCR), and grade received for the course (MTNGRAD). Appendix D provides a detailed list of college-level math courses. Students who took a credit-bearing college-level math course on this list and received a valid grade for or passed the course were considered to have earned credits in college-level math courses. This variable has two categories:

Earned
Did not earn

Enrolled in any college-level English courses **ATTENG**

Indicates whether a student enrolled in any college-level English courses through 2009 based on students' transcripts. This variable was derived from the PETS course code (MTPETC), potential course credit (MTPOTCR), and grade received for the course (MTNGRAD). Appendix D provides a detailed list of college-level English courses. Students who took a credit-bearing college-level English course on this list and received any grade including a failing grade were considered to have enrolled in college-level English courses. This variable has two categories:

Enrolled
Did not enroll

Enrolled in any college-level math courses **ATTMATH**

Indicates whether a student enrolled in any college-level math courses through 2009 based on students' transcripts. This variable was derived from the PETS course code (MTPETC), potential course credit (MTPOTCR), and grade received for the course (MTNGRAD). Appendix D provides a detailed list of college-level math courses. Students who took a credit-bearing college-level math course on this list and received any grade including a failing grade were considered to have enrolled in college-level math courses. This variable has two categories:

Enrolled
Did not enroll

[49] The PETS course code is a 6-digit number derived from the 2010 Classification of Instructional Programs (CIP) and the 2003 College Course Map (CCM). More information on PETS course codes is available in appendix D.

POWERSTATS VARIABLE

Enrollment intensity in 2003−04 **ENINPT1**

Indicates the pattern of enrollment intensity for the months in which a student was enrolled during the 2003−04 academic year. This variable has three categories:

Always full-time
Always part-time
Mixed

Ever attended a 4-year institution through 2009 **IT4Y6Y**

Indicates whether a student had ever attended a 4-year institution from 2003 to 2009. This variable has two categories:

Attended
Did not attend

Highest degree student expected in 2003−04 **HIGHLVEX**

Indicates the highest level of education that a student in 2003−04 expected to eventually complete. This variable was recoded to have the following categories:

No degree or subbaccalaureate degree
Bachelor's degree
Graduate or professional degree

Highest education of parents **PAREDUC**

Indicates the highest level of education completed by the student's mother or father, whoever had the highest level. This variable was recoded into the following categories:

High school or less
Some postsecondary
Bachelor's degree or higher

Income level **INCGRP2**

Indicates the income level of independent students or parents of dependent students in 2003–04. This variable has the following categories:

Lowest 25 percent
Lower middle 25 percent
Upper middle 25 percent
Highest 25 percent

POWERSTATS VARIABLE

Level and control of institution first attended in 2003−04 **FSECTOR**

Indicates the level and control of the first institution a student attended in 2003–04, based on the classification in the 2003 Integrated Postsecondary Education Data System (IPEDS) Institutional Characteristics file. Control concerns the source of revenue and control of operations (public, private nonprofit, for-profit), and level concerns the highest degree or award offered by the institution in any program. This variable has the following categories and was used to select the sample of students beginning at public 2- and 4-year institutions.

4-year
- Public
- Private nonprofit
- For-profit

2-year
- Public
- Private nonprofit
- For-profit

Less-than-2-year
- Public
- Private nonprofit
- For-profit

Level of institution last attended through 2009 **ITLVLA6Y**

Indicates the level of the institution a student last attended through 2009. This variable has the following categories:

4-year
2-year
Less-than-2-year

Level of destination institution first transferred to **TFINLV6Y**

Indicates the level of the first institution and destination institution to which a student first transferred through 2009. This variable was recoded into the following categories:

Never transferred
Transferred from 2-year to 4-year institution
All other transfers

Number of months between postsecondary entry and first remedial course **TMPSER**

Indicates the total number of months elapsed between initial postsecondary entry and first remedial course based on students' transcripts. This variable was derived by first determining the enrollment timing of the first remedial course (MTPETC—PETS course code and MTTMBEG—course staring date) and then using the postsecondary enrollment starting date (QDFAEVMY) to determine the number of months elapsed. See appendix D for a detailed list of remedial courses.

Number of months between postsecondary entry and first remedial English/reading course **TMPSERER**

Indicates the total number of months elapsed between initial postsecondary entry and first remedial English/reading course based on students' transcripts. This variable was derived by first determining the enrollment timing of the first remedial English/reading course (MTPETC—PETS course code and MTTMBEG—course staring date) and then using the postsecondary enrollment starting date (QDFAEVMY) to determine the number of months elapsed. See appendix D for a detailed list of remedial English/reading courses.

POWERSTATS VARIABLE

Number of months between postsecondary entry and first remedial math course **TMPSERM**

Indicates the total number of months elapsed between initial postsecondary entry and first remedial math course based on students' transcripts. This variable was derived by first determining the enrollment timing of the first remedial math course (MTPETC—PETS course code and MTTMBEG—course staring date) and then using the postsecondary enrollment starting date (QDFAEVMY) to determine the number of months elapsed. See appendix D for a detailed list of remedial math courses.

Number of remedial courses taken in any field through 2009 **QETOTR**

Indicates the total number of remedial courses (in any fields) taken through 2009 based on students' transcripts. This variable was available in BPS:04/09 and used to determine whether a student took any remedial courses and how many the student took through 2009. See appendix D for a detailed list of remedial courses.

Number of remedial English/reading courses taken through 2009 **REMRER**

Indicates the total number of remedial English (QEENGR) and reading courses (QEREADR) taken through 2009 based on students' transcripts. This variable was derived by summing these two variables and used to determine whether a student took any remedial English/reading courses and how many the student took through 2009. See appendix D for a detailed list of remedial English/reading courses.

Number of remedial math courses taken through 2009 **QEMATHR**

Indicates the total number of remedial math courses taken through 2009 based on students' transcripts. This variable was available in BPS:04/09 and used to determine whether a student took any remedial math courses and how many the student took through 2009. See appendix D for a detailed list of remedial math courses.

Percent minority enrollment in the first institution in 2003−04 **PCT_MIN**

Indicates the percentage of total undergraduates enrolled at the first institution attended in 2003–04 who were minority students. This variable was recoded to have the following categories:

0–10 percent
>10–20 percent
>20–30 percent
>30–40 percent
>40–50 percent
>50 percent

Plan to transfer in 2003−04 **DGTRNY1**

Indicates a student's degree expectations and whether he or she had plans to transfer to a 4-year institution. The question was asked in 2003−04. This variable was recoded to have the following categories:

Planned to transfer
Did not plan to transfer

POWERSTATS VARIABLE

Precollege academic preparation composite **COLLPREP**

Indicates the level of a student's precollege academic preparation. This composite variable was derived from three precollege academic indicators: the highest level of math coursetaking in high school; high school grade point average (GPA); and college admission test scores (SAT/ACT). The construction of this variable is as follows:

- Recoded the highest level of math coursetaking in high school (MCMATH) so that "algebra 2 or lower" was considered as the low level of math coursetaking; "trigonometry or precalculus" as the middle level; and "calculus" as the high level.
- Recoded cumulative high school GPA (HCGPAREP) so that a grade of "less than 2.50" was considered as the low level of GPA; a grade of "2.50–3.49" as the middle level; and a grade of "3.5 or higher" as the high level.
- Recoded college admission test scores (TESATDER) so that a score of "0−840" was considered as the low level; a score of "850−1,130" as the middle level; and a score of "1,140 or higher" as the high level.
- If none of the three recoded measures were missing, then students were classified as having weak academic preparation if at least two of these recoded measures were designated as low level; students were classified as having strong academic preparation if at least two of these recoded measures were designated as high level; and the remaining students were classified as having moderate academic preparation.
- If one of the three recoded measures was missing, then students were classified as having weak academic preparation if two of the nonmissing recoded measures were designated as low level; students were classified as having strong academic preparation if two of the nonmissing recoded measures were designated as high level; and the remaining students were classified as having moderate academic preparation.
- If two of the three recoded measures were missing, then students were classified as having weak academic preparation if the nonmissing recoded measure was designated as low level; students were classified as having strong academic preparation if the nonmissing recoded measure was designated as high level; and the remaining students were classified as having moderate academic preparation.

Because BPS:04/09 did not collect data on the three academic indicators for students age 24 or older, information on the precollege academic preparation composite cannot be obtained for these students (13 percent of the study sample in this study). To prevent sample loss, this study included all missing cases in both the bivariate and multivariate analyses by putting them into an "unknown" category. Thus, this precollege academic preparation composite measure has the following categories:

Weak
Moderate
Strong
Unknown

Race/ethnicity **RACE**

Indicates a student's race/ethnicity with Hispanic or Latino origin as a separate category. All of the race categories exclude Hispanic origin unless specified.

White
Black
Hispanic
Asian
All other races

POWERSTATS VARIABLE

Region of institution first attended in 2003−04 **OBEREG**

Indicates the region of the institution first attended in 2003–04. This variable has the following categories:

New England	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut.
Mideast	New Jersey, New York, Delaware, District of Columbia, Maryland, Pennsylvania
Great Lakes	Illinois, Indiana, Michigan, Ohio, Wisconsin
Plains	Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota
Southeast	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Arkansas, Louisiana, Virginia, West Virginia
Southwest	Arizona, New Mexico, Oklahoma, Texas
Rocky Mountains	Colorado, Montana, Utah, Wyoming, Idaho
Far West	Alaska, California, Hawaii, Nevada, Oregon, Washington
Other Jurisdictions	Puerto Rico

Remedial coursetaking across multiple subjects **REMECRS**

Indicates whether a student took remedial courses across different subject areas. This variable was derived from the number of remedial courses taken in English (QEENGR), reading (QEREADR), mathematics (QEMATHR), and other areas (QEOTHERR), and it has the following categories:

Did not take any remedial course
Took remedial courses in one subject area
Took remedial courses across multiple subject areas

Selectivity of first-attended 4-year institution **SELECTV2**

Indicates the level of selectivity of the public or private nonprofit 4-year institution first attended by the student in 2003–04. The selectivity of institution was developed only for public and private nonprofit 4-year institutions using the following criteria: whether the institution was open admission (had no minimal requirements); the number of applicants; the number of students admitted; the 25th and 75th percentiles of ACT and/or SAT scores; and whether test scores were required for admission. For more information, see Cunningham, A.F. (2006). *Changes in Patterns of Prices and Financial Aid* (NCES 2006-153). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC. This variable has the following categories, and the last category, "minimally selective/open admission," includes all for-profit 4-year institutions.

Highly selective
Moderately selective
Minimally selective/open admission

Sex **GENDER**

Indicates the sex of a student.

Male
Female

POWERSTATS VARIABLE

Size of institution first attended in 2003−04 **ENRLSIZE**
Indicates the total enrollment in fall 2003 for the first institution a student attended. This variable was recoded into the following categories:

1–1,999
2,000–4,999
5,000–9,999
10,000–14,999
15,000 or higher

Student age in 2003−04 **AGEGROUP**
Indicates a student's age in 2003−04. This variable was recoded into the following categories:

18 or younger
19
20–23
24 or older

Study weight **WTD000**
The weight variable designed for longitudinal analyses that include variables derived from all three waves of survey data from BPS:04/09 (2004, 2006, and 2009 surveys) as well as transcript variables from the 2009 Postsecondary Education Transcript Study (PETS:09).

Total number of credits earned in the first year of enrollment **QE1STERN**
Indicates the total number of credits that a student earned in the first year of enrollment. Credits include those earned in remedial courses.

Total number of credits earned through 2009 **TOTCRDT**
Indicates the total number of credits that a student earned through 2009. This variable was derived from the postsecondary course code (MTPETC), normalized credits designated for a course (MTNORMCR), and normalized grade received for a course (MTNGRAD). Total credits include those earned in remedial courses.

Total number of college-level credits earned through 2009 **COLLCRDT**
Indicates the total number of college-level credits that a student earned through 2009. This variable was derived from the postsecondary course code (MTPETC), normalized credits designated for a course (MTNORMCR), and normalized grade received for a course (MTNGRAD). Total college-level credits exclude those earned in remedial courses.

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Appendix B—Technical Notes and Methodology

Data Sources

The analysis presented in this report is based on data from the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and its 2009 Postsecondary Education Transcript Study (PETS:09) component. The U.S. Department of Education's National Center for Education Statistics (NCES) conducts BPS to provide nationally representative data on key issues in postsecondary education. BPS follows a nationally representative sample of students enrolled in postsecondary education for the first time, thereby exploring topics related to postsecondary enrollment and persistence in the United States and addressing the benefits of postsecondary education to individuals and society (Radford et al. 2010). BPS:04/09 is the latest in the series of administrations of the survey. The two previous administrations were conducted between 1990 and 1994 (BPS:90/94) and between 1996 and 2001 (BPS:96/2001).

BPS:04/09

BPS:04/09 began with a nationally representative sample of students who entered postsecondary education for the first time in the 2003−04 academic year. The initial sample of approximately 19,000 first-time beginning students was drawn from the 2003−04 National Postsecondary Student Aid Study (NPSAS:04). These students were then surveyed at three time points: in 2004, at the end of their first year in postsecondary education; in 2006, approximately 3 years after they had started postsecondary education; and in 2009, approximately 6 years after they had started. The final BPS:04/09 dataset contains information on nearly 16,700 students with an overall weighted response rate of 89 percent (Radford et al. 2010).

In the 2004 interview, first-time beginning students were asked a variety of questions regarding their academic and social experiences during the first year, their work while enrolled, their education plans and long-term goals, their demographic characteristics, and their family responsibilities and backgrounds. The 2006 interview focused on students' enrollment patterns since 2004, including transfers, stopout periods, attendance intensity, and completion of certificates and degrees. Those who were no longer enrolled were asked about their employment experiences. The last

interview in 2009 focused on the degree completion of those still enrolled after 2006, the graduate school enrollment of those who had completed bachelor's degrees, and the employment of those no longer enrolled. In all 3 study years, student interviews were conducted via web-based questionnaires that were either self-administered or conducted by a trained interviewer via telephone.

Besides interview data, BPS:04/09 also collected information from other sources, including respondents' NPSAS:04 institutions, the Integrated Postsecondary Education Data System (IPEDS), the National Student Loan Data System (NSLDS), the College Board and ACT, Inc., and the National Student Clearinghouse (NSC). Together, these data provide information on students' demographic characteristics, their persistence in and completion of postsecondary education programs, their transition into employment, and changes over time in their goals, marital status, income, and debt.

PETS:09

Postsecondary transcripts for students who were sampled for BPS:04/09 were collected as part of PETS:09. Transcripts were requested from 3,030 eligible postsecondary institutions[50] that members of the BPS:04/09 sample attended between July 1, 2003, and June 30, 2009. Of the eligible institutions, 2,620 (some 87 percent) provided transcripts for the cohort, resulting in 16,960 PETS sample members (92 percent) with at least one transcript available for analysis. The transcripts provided a detailed portrait of students' enrollment, coursetaking, credit accumulation, academic performance, and degree histories. For additional information on BPS:04/09 and the associated PETS:09 transcript collection, see Wine, Janson, and Wheeless (2011).

Response Rates and Bias Analysis

NCES Statistical Standards require that nonresponse bias analysis be conducted if the response rate at any level (institutions, students, items) is below 85 percent (Seastrom 2014). A brief discussion about transcript collection response rates at the

[50] Eligible institutions are those that meet all criteria for distributing federal aid authorized under Title IV of the Higher Education Act. These criteria are institutions should (1) offer an educational program designed for persons who have completed a high school education; (2) offer at least one academic, occupational, or vocational program of study lasting at least 3 months or 300 clock hours; (3) offer courses that are open to persons other than the employees or members of the company or group (e.g., union) that administers the institution; and (4) be located in the 50 states, the District of Columbia, or Puerto Rico (Wine, Janson, and Wheeless 2011).

three levels that are pertinent to this study follows. For detailed information about response rates and related bias analysis, see Wine, Janson, and Wheeless (2011).

Institution, Student, and Item Response Rates

NCES Statistical Standard 4-4-1 states that "[a]ny survey stage of data collection with a unit or item response rate less than 85 percent must be evaluated for the potential magnitude of nonresponse bias before the data or any analysis using the data may be released" (Seastrom 2014). In the case of BPS:04/09, this means that nonresponse bias analysis could be required at any of three levels: institutions, study respondents, or items.

For BPS:04/09, the overall weighted institution response rate at the base year was 80 percent (see Wine, Janson, and Wheeless 2011, table 45). Institution nonresponse bias analysis was performed as a part of NPSAS:04 and is described in the *NPSAS:04 Full-scale Methodology Report* (Cominole et al. 2006). Of the 3,030 eligible institutions attended by the members of the BPS:04/09 cohort, 2,620 institutions provided at least one transcript for each cohort member who attended that institution, resulting in a response rate of 87 percent (see Wine, Janson, and Wheeless 2011, table 26).

Of a total of 18,600 students determined to be eligible for the BPS:04/09 study,[51] 16,700 (or 89 percent) had enough data from the student interview or from administrative sources to be classified as BPS:04/09 study respondents (Wine, Janson, and Wheeless 2011). Overall, 86 percent of the 18,600 BPS:04/09 eligible sample were panel respondents (i.e., they responded to all three of the NPSAS:04, BPS:04/06, and BPS:04/09 surveys). At least one transcript was collected from 91 percent of the BPS:04/09 eligible sample (i.e., transcripts were collected for 280 of the students eligible for BPS:04/09 who did not have enough interview or administrative data to be classified as BPS:04/09 study respondents).

Table B-1 displays the item-level response rates for variables used in this report (see appendix A). All of them have an item-level response rate equal to or above 85 percent, except for the following five variables:

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[51] Eligible students are those who were enrolled in eligible institutions and who also satisfied both of the following requirements: (1) they were enrolled in an academic program; at least one course for credit that could be applied toward fulfilling the requirements for an academic degree; or an occupational or vocational program that required at least 3 months or 300 clock hours of instruction to receive a degree, certificate, or other formal award; and (2) they were not concurrently or solely enrolled in high school or in a General Educational Development (GED) program or other high school completion program (Wine, Janson, and Wheeless 2011).

- TMPSER—number of months between postsecondary entry and first remedial course;
- TMPSERER—number of months between postsecondary entry and first remedial English/reading course;
- TMPSERM—number of months between postsecondary entry and first remedial math course; and total number of college-level credits earned through 2009;
- TOTCRDT—Total number of credits earned through 2009;
- COLLCRDT—Total number of college-level credits earned through 2009.

Table B-1.
Item nonresponse rates for variables used in this study

Variable	Description	Item response rate	Item non-response rate
ACAINX04	Academic integration in 2003–04	92.4	7.6
PASSTOTR[1]	Completion status of remedial courses in any field	99.8	0.2
PASSRER[1]	Completion status of remedial English/reading courses	99.8	0.2
PASSRMTH[1]	Completion status of remedial math courses	99.8	0.2
PROUT1	Cumulative postsecondary persistence by the end of academic year 2003−04	100.0	0.0
PROUT2	Cumulative postsecondary persistence by the end of academic year 2004−05	100.0	0.0
PROUT3	Cumulative postsecondary persistence by the end of academic year 2005−06	100.0	0.0
PROUT4	Cumulative postsecondary persistence by the end of academic year 2006−07	100.0	0.0
PROUT5	Cumulative postsecondary persistence by the end of academic year 2007−08	100.0	0.0
PROUT6	Cumulative postsecondary persistence by the end of academic year 2008−09	100.0	0.0
ERNENG[1]	Earned any credits in college-level English courses	99.3	0.7
ERNMATH[1]	Earned any credits in college-level math courses	99.2	0.8
ATTENG[1]	Enrolled in any college-level English courses	99.5	0.5
ATTMATH[1]	Enrolled in any college-level math courses	99.4	0.6
ENINPT1	Enrollment intensity in 2003−04	100.0	0.0
IT4Y6Y	Ever attended a 4-year institution through 2009	100.0	0.0
HIGHLVEX	Highest degree student expected in 2003−04	100.0	0.0
INCGRP2	Income level in 2003−04	100.0	0.0
ITLVLA6Y	Level of institution last attended through 2009	100.0	0.0
FSECTOR	Level and control of institution first attended in 2003−04	100.0	0.0
TFINLV6Y	Level of destination institution first transferred to	100.0	0.0
TMPSER[1]	Number of months between postsecondary entry and first remedial course	77.8	22.2
TMPSERER[1]	Number of months between postsecondary entry and first remedial English/reading course	79.4	20.6
TMPSERM[1]	Number of months between postsecondary entry and first remedial math course	79.7	20.3
QETOTR	Number of remedial courses taken in any field through 2009	99.8	0.2
REMRER[1]	Number of remedial English/reading courses taken through 2009	99.8	0.2
QEMATHR	Number of remedial math courses taken through 2009	99.8	0.2
PAREDUC	Parents' highest level of education	97.3	2.7
PCT_MIN	Percent minority enrollment in the first institution in 2003−04	91.0	9.0
DGTRNY1	Plan to transfer in 2003−04	100.0	0.0
COLLPREP[1,2]	Precollege academic preparation composite	100.0	0.0
RACE	Race/ethnicity	100.0	0.0
REMECRS[1]	Remedial coursetaking across multiple subjects	99.3	0.7
SELECTV2	Selectivity of 4-year institution first attended in 2003−04	99.8	0.2
GENDER	Sex	100.0	0.0
ENRLSIZE	Size of institution first attended in 2003−04	100.0	0.0
OBEREG	Region of institution first attended in 2003−04	100.0	0.0
AGEGROUP	Student age in 2003−04	100.0	0.0
QE1STERN	Total number of credits earned in the first year of enrollment	96.3	3.7
TOTCRDT[1]	Total number of credits earned through 2009	81.1	18.9
COLLCRDT[1]	Total number of college-level credits earned through 2009	82.2	17.8

[1] This variable was derived specifically for this report and does not exist on the current BPS:04/09 data files.

[2] Information on this variable was not available for about 13 percent of the study sample age 24 or above. These students were not treated as "missing" and are included in the "unknown" category in the analysis.

NOTE: The item response and nonresponse rates were computed using the BP:04/09 study respondent panel weight variable (WTD000), designed for longitudinal analyses that include variables derived from all three waves of survey data from BPS:04/09 (2004, 2006, and 2009 surveys), as well as transcript variables from the 2009 Postsecondary Education Transcript Study (PETS:09). The item response rate was computed as the number of cases who responded to the item and did not have a legitimate skip for the item divided by the total number of cases who did not have a legitimate skip for the item.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Nonresponse bias analysis was conducted for these five variables as required by NCES standards 4-4-1 and 4-4-3. A summary of nonresponse bias analysis results appears in table B-2.

Table B-2.
Summary of bias analysis results for five student-level variables used in this study

Variable name	Item nonresponse rate (weighted by WTD000)	Median relative bias across characteristics[1]	Percentage of characteristics with relative bias of more than 10 percent[1]	Percentage of characteristics with significant bias	Characteristic with greatest significant bias
TMPSER	22.2	4.2	23.6	52.8	High school graduation year (between 2003 and 2004)
TMPSERER	20.6	4.0	17.3	42.3	High school graduation year (between 2003 and 2004)
TMPSERM	20.3	3.4	18.8	37.7	High school graduation year (between 2003 and 2004)
TOTCRDT	18.9	1.5	2.6	13.0	Undergraduate enrollment (the lowest quartile)
COLLCRDT	17.8	1.3	2.6	10.4	Undergraduate enrollment (the lowest quartile)

[1] The bias for a variable of interest caused by item nonresponse Is estimated by subtracting the mean of the variable based on all sample cases from the mean of the variable based only on item respondents. The relative bias, which provides a measure of the bias magnitude, is the ratio of the estimated bias and the mean of the variable based on item respondents. In general, a bias ratio of 10 percent or less has little effect on the significance test. More information on nonresponse bias analysis, see Seastrom (2014), *NCES Statistical Standards* (NCES 2014-097), or visit http://nces.ed.gov/statprog/2002/appendixb.asp.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

For more information on item-level nonresponse bias analysis, see *NCES Statistical Standards* (http://nces.ed.gov/statprog/) or *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09): Full-scale Methodology Report* (http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2012246).

Weighting

All estimates in this report were weighted to compensate for unequal probability of selection into the survey sample and to adjust for nonresponse. The weight variable used for analysis of the BPS:04/09 and PETS:09 data was WTD000, a longitudinal weight designed for 2003−04 beginning postsecondary students who participated in all surveys and who also had at least one transcript available for analysis.

Statistical Procedures

Differences Between Two Estimates

The descriptive comparisons of two estimates (e.g., means and proportions) were tested using Student's *t* statistic. Differences between estimates were tested against the probability of a Type I error[52] or significance level. The statistical significance of each comparison was determined by calculating the Student's *t* value for the difference between each pair of estimates and comparing the *t* value with published tables of significance levels for two-tailed hypothesis testing. Student's *t* values were computed to test differences between independent estimates using the following formula:

$$t = \frac{E_1 - E_2}{\sqrt{se_1^2 + se_2^2}}$$

There are some hazards in reporting statistical tests for each comparison. First, comparisons based on large *t* statistics may appear to merit special attention. This can be misleading because the magnitude of the *t* statistic is related not only to the observed differences in estimates but also to the number of respondents in the specific categories used for comparison. Hence, a small difference compared across a large number of respondents would produce a large (and possibly statistically significant) *t* statistic.

A second hazard in reporting statistical tests is the possibility that one can report a "false positive" or Type I error. Statistical tests are designed to limit the risk of this type of error using a value denoted by alpha. The alpha level of .05 was selected for findings in this report and ensures that a difference of a certain magnitude or larger would be produced when there was no actual difference between the quantities in the underlying population no more than 1 time out of 20. When analysts test hypotheses that show alpha values at the .05 level or smaller, they reject the null hypothesis that there is no difference between the two estimates. Failing to reject a null hypothesis (i.e., failing to detect a difference), however, does not imply the values are the same or equivalent.

Multinomial Probit Regression

Most of the multivariate analysis in this study used multinomial probit (MNP) regression. MNP is used when the outcome of interest has two or more discrete

[52] A Type I error occurs when one concludes that a difference observed in a sample reflects a true difference in the population from which the sample was drawn, when no such difference is present.

categories (e.g., whether a student had attained a degree, had not attained a degree but was still enrolled, or had dropped out of college without a degree or certificate as of 2009). MNP is one of the most common statistical techniques used to predict the probability of an event that will occur or the probability of a respondent choosing a certain outcome out of several mutually exclusive alternatives[53] (Borooah 2001; Koop 2008). Assuming that each individual faces a set of outcomes, an MNP model formulation may be written as follows:

$$y_{ij}^{*} = x_i^{'}\beta_j + \varepsilon_{ij}$$

where i (=1, 2, …, N) represents an individual; j (=1, 2, …, M) represents one of M different outcomes of the dependent variable y_i ; x_i' is a vector of independent variables that may be associated with or influence an individual's outcome or choice; and the error term, ϵ_{ij}, is assumed to follow a multivariate normal distribution. MNP assumes that each individual chooses the option yielding the highest utility of all alternatives. That is, an individual i chooses the outcome j if the outcome y_{ij}^{*} is the highest for j:

$$y_i = \begin{cases} j \text{ if } y_{ij}^{*} = \max(y_{i1}^{*}, y_{i2}^{*}, ..., y_{iM}^{*}) \\ \qquad 0 \text{ otherwise.} \end{cases}$$

The probability of an individual i choosing outcome j is conditional on or a function of the set of independent variables, x_i':

$$p(y_i = j \mid x_i') = (F_j (x_i', \varepsilon_i) \text{ (j = 1,…, M, i = 1,…, N)}$$

where for a probit analysis, F represents a cumulative probability function based on the normal distribution. Only M−1 of the probabilities can be freely specified because the probability for all alternatives sum to one (i.e., $p(y_i = 1) + p(y_i = 2) + \ldots + p(y_i = M) = 1$).

The parameters of MNP models are generally not directly interpretable. Instead, researchers often rely on marginal effects (ME) to interpret MNP results (Liao 1994). The ME for an independent variable measures the change in the probability that

[53] This report used a probit rather than a logit model because probit models do not require an assumption of independence of irrelevant alternatives (IIA). IIA implies that the preferences between alternatives A and B depend only on the individual preferences between A and B. In other words, if A is preferred to B out of the choice set {A,B}, then introducing a third alternative C, and thus expanding the choice set to {A,B,C}, must not change the preferences between A and B (i.e., A is still preferred to B after including C). An MNP model relaxes this requirement and allows more flexibility for considering outcomes in the analysis.

alternative *j* is the outcome when this independent variable changes by one unit. For a categorical variable, the ME measures the change in the probability of the outcome that would occur if this categorical variable changes from 0 (reference category) to 1 (category of interest), holding all other independent variables constant. For a continuous independent variable, the ME measures the instantaneous rate of change, which typically depends on the position or value of the continuous variable. In this case, the use of the average ME, which is the mean value of MEs corresponding to all values of this continuous independent variable, is recommended.

Negative Binomial Regression

This study also used negative binomial (NB) regression to examine the net association between remediation enrollment/completion and the total number of college-level credits that a student earned through 2009. NB, a special kind of Poisson regression model, was used because the outcome of interest is a count variable—a variable that takes on only integer values of 0 or greater (0, 1, 2, 3, . . .) reflecting the number of occurrences of an event in a fixed period of time. In general, when the outcome variable in a regression is a count variable, Poisson regression is a more appropriate model than ordinal least squares (OLS) regression. OLS may result in biased standard errors and inappropriate significance tests due to violations of such OLS regression assumptions as constant variance and normal conditional distribution of error (Cohen and Cohen 1983; Coxe, West, and Aiken 2009; Gardner, Mulvey, and Shaw 1995). Poisson regression models are built on the Poisson distribution, which is a discrete distribution that takes on a probability value only for nonnegative integers (Coxe, West, and Aiken 2009). This property makes it an excellent choice for modeling count outcomes. The standard Poisson regression model can be expressed by the following equation:

$$\ln(\hat{y}_i) = b_0 + b_1x_{i1} + b_2x_{i2} + \ldots b_nx_{in}$$

where $\hat{y}_i$ is the predicted count for an individual *i* on the outcome variable given the specific values on the independent variables x_{i1}, x_{i2}, . . . x_{in}; the symbol ln represents the natural logarithm; the intercept, b_0, is the estimated value of $\ln(y)$ when all values of the independent variables (x_1, x_2, …, x_n) are zero; and the regression coefficient b_j (j=1, 2, …, n), indicates the average change in the predicted value of $\ln(y_i)$ that is associated with a one-unit change in x_j while keeping all other independent variables constant in the model. The variable x_j is said to have a significant association with the outcome variable if b_j is tested to be statistically significant from zero.

There are situations in which observed count data do not meet all of the assumptions of the standard Poisson regression. One common situation has to do with the problem of "overdispersion," in which the variance of the count variable exceeds its mean, violating the "equidispersion" assumption[54] of the standard Poisson regression. Overdispersion occurs for two main reasons: individual differences unaccounted for by the regression model (i.e., some important variables may be omitted in the regression); and dependent occurrences (i.e., each count that occurs for an individual may not be an independent event as assumed by the Poisson distribution). If the problem of overdispersion is present but not accounted for, the standard Poisson regression model may underestimate the standard errors and overstate the significance of the regression coefficients, therefore providing misleading inferences about the regression parameters.

NB is one of the common regression models for handling overdispersion. The model is based on the Poisson distribution but assumes that there is unexplained variability among individuals who have the same predicted outcome value. This additional variability between individuals would lead to larger variance in the overall outcome distribution than what would be expected from the Poisson distribution. Thus, the NB regression produces the same mean as but larger variance than the standard Poisson regression. More technical information on Poisson and NB regression models can be found in Cameron and Trivedi (2013), Gardner, Mulvey, and Shaw (1995), and Coxe, West, and Aiken (2009).

[54] Equidispersion refers to a situation in which the expected mean of the count variable equals its variance.

Appendix C—Multivariate Analysis Results

Tables C-1 through C-7 present the multivariate regression results for the association of remedial course enrollment and completion with various postsecondary outcomes. The analysis was conducted separately for postsecondary students beginning at public 2- and 4-year institutions.

Table C-1.
REGRESSION ON EARNING COLLEGE-LEVEL ENGLISH CREDITS: Average marginal effects of various characteristics on the probability of earning any college-level English course credits among 2003−04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted probability of attaining this outcome for various groups of students

Characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Weak academic preparation[3]				
Enrolled in remedial English/reading courses and completed all[4]	7.3	75.8	9.6	97.2 *
Enrolled in remedial English/reading courses and completed some[4]	-4.2	64.3	-4.1	83.4
Enrolled in remedial English/reading courses and completed none[4]	-17.0	51.5 *	-31.5	56.0 *
Did not enroll in any English/reading remedial courses	†	*68.6*	†	*87.5*
Moderate/strong academic preparation[3]				
Enrolled in remedial English/reading courses and completed all[4]	5.0	82.4	-0.5	92.0
Enrolled in remedial English/reading courses and completed some[4]	-30.2	47.3 *	-9.9	82.6
Enrolled in remedial English/reading courses and completed none[4]	-23.6	53.9 *	-7.2	85.2
Did not enroll in any English/reading remedial courses	†	*77.5*	†	*92.5*
Unknown level of academic preparation[3]				
Enrolled in remedial English/reading courses and completed all[4]	9.8	72.4	5.3	88.2
Enrolled in remedial English/reading courses and completed some[4]	-24.3	38.2 *	17.1	100.0 *
Enrolled in remedial English/reading courses and completed none[4]	-8.4	54.1	-2.5	80.3
Did not enroll in any English/reading remedial courses	†	*62.5*	†	*82.9*
Other characteristics as controls				
Sex				
Female	9.5	74.0 *	2.5	92.4 *
Male	†	*64.5*	†	*89.9*
Race/ethnicity[5]				
Black	-3.6	67.6	-1.0	90.9
Hispanic	-4.4	66.8	-2.2	89.8
Asian	2.0	73.2	0.5	92.4
All other races	-1.7	69.6	-5.5	86.4 *
White	†	*71.2*	†	*91.9*
Highest education of parents				
High school or less	-6.2	67.4 *	-2.3	89.6
Some college	-2.9	70.6	-0.3	91.6
Bachelor's degree or higher	†	*73.6*	†	*92.0*
Income level[6]				
Lowest 25 percent	-5.2	67.6	-3.0	89.4
Lower middle 25 percent	-4.5	68.2	-1.2	91.1
Upper middle 25 percent	-1.4	71.4	-0.4	91.9
Highest 25 percent	†	*72.8*	†	*92.3*

See notes at end of table.

Table C-1.
REGRESSION ON EARNING COLLEGE-LEVEL ENGLISH CREDITS: Average marginal effects of various characteristics on the probability of earning any college-level English course credits among 2003−04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted probability of attaining this outcome for various groups of students —Continued

Characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Highest degree expected in 2003–04				
Bachelor's degree	9.9	70.0 *	16.1	92.0 *
Advanced degree	14.6	74.7 *	15.6	91.5 *
No degree/subbaccalaureate degree	†	*60.1*	†	*75.8*
Attendance intensity in 2003–04				
Always part-time	-16.6	60.5 *	-6.2	85.8 *
Mixed	-2.0	75.1	-3.5	88.5
Always full-time	†	*77.2*	†	*92.0*
Academic integration in 2003–04				
Low	-15.2	66.7 *	-5.2	88.2 *
Moderate	-10.5	71.5 *	-1.8	91.7
High	†	*82.0*	†	*93.4*
Enrollment size of the institution first attended				
1,999 or fewer	-6.0	66.8	4.0	94.2
2,000−4,999	-6.8	66.0	-0.6	89.5
5,000−9,999	-0.3	72.5	2.1	92.2
10,000−14,999	-3.2	69.6	3.0	93.2 *
15,000 or more	†	*72.8*	†	*90.2*
Percent minority enrollment in the institution first attended				
0–10%	7.0	72.2	-2.2	89.6
>10–20%	5.0	70.1	-1.4	90.3
>20–30%	4.8	70.0	0.2	91.9
>30–40%	7.9	73.1	1.5	93.2
>40–50%	10.8	75.9 *	5.1	96.9 *
>50%	†	*65.2*	†	*91.7*
Selectivity of first-attended 4-year institution[7]				
Highly selective	†	†	3.0	91.4
Moderately selective	†	†	4.1	92.5 *
Minimally selective/open admission	†	†	†	88.4

See notes at end of table.

Table C-1.
REGRESSION ON EARNING COLLEGE-LEVEL ENGLISH CREDITS: Average marginal effects of various characteristics on the probability of earning any college-level English course credits among 2003−04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted probability of attaining this outcome for various groups of students —Continued

Characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Region of the institution first attended				
New England	21.1	82.6 *	8.0	94.9 *
Mideast	11.7	73.2 *	4.2	91.1
Great Lakes	7.6	69.1	6.2	93.1 *
Plains	8.6	70.1	5.0	91.8
Southeast	10.4	71.9 *	4.8	91.7 *
Southwest	14.5	76.0 *	3.9	90.8
Rocky Mountains	-5.3	56.2	5.3	92.2 *
Other Jurisdictions	-8.2	53.3	-21.6	65.3 *
Far West	*†*	*61.5*	*†*	*86.9*

† Not applicable.

* $p < .05$

[1] Marginal effect measures the average percentage point change in the predicted probability of attaining an outcome associated with a one-unit change in an independent variable, after controlling for the covariation of the variables in the model.

[2] Average predicted probability of attaining an outcome after controlling for the covariation of the variables in the model.

[3] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the multinomial probit (MNP) model as an "unknown" category. See appendix A for detailed construction of this variable.

[4] Completion of a remedial course means that students earned either a passing grade or some credits in that course.

[5] Black includes African American, Hispanic includes Latino, and "All other races" includes American Indian, Alaska Native, Native Hawaiian, Other Pacific Islander, and individuals who indicated Two or more races or Other.

[6] The total income in 2003–04 for independent students or parents of dependent students.

[7] The selectivity of institution was developed only for public and private nonprofit 4-year institutions using the following criteria: whether the institution was open admission (had no minimal requirements); the number of applicants; the number of students admitted; the 25th and 75th percentiles of ACT and/or SAT scores; and whether test scores were required for admission. For more information, see Cunningham, A.F. (2006). *Changes in Patterns of Prices and Financial Aid* (NCES 2006-153). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

NOTE: F-tests for the MNP models for beginning postsecondary students at public 2- and 4-year institutions are 17.7 and 159.8, with the degree of freedom of 340 and 382, respectively ($p<0.05$). The italicized category in each variable is the comparison group. Estimates include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:2009).

Table C-2.
REGRESSION ON EARNING COLLEGE-LEVEL MATH CREDITS: Average marginal effects of various characteristics on the probability of earning any college-level math course credits among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted probability of attaining this outcome for various groups of students

Characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Weak academic preparation[3]				
Enrolled in remedial math courses and completed all[4]	20.7	62.1 *	18.6	80.5 *
Enrolled in remedial math courses and completed some[4]	-4.8	36.5	2.3	64.3
Enrolled in remedial math courses and completed none[4]	-22.9	18.5 *	-16.7	45.2 *
Did not enroll in any math remedial courses	†	*41.4*	†	*61.9*
Moderate/strong academic preparation[3]				
Enrolled in remedial math courses and completed all[4]	2.9	64.5	-8.6	77.2 *
Enrolled in remedial math courses and completed some[4]	-27.8	33.8 *	-15.7	70.1 *
Enrolled in remedial math courses and completed none[4]	-47.3	14.4 *	-28.7	57.1 *
Did not enroll in any math remedial courses	†	*61.6*	†	*85.8*
Unknown level of academic preparation[3]				
Enrolled in remedial math courses and completed all[4]	16.3	52.2 *	6.5	76.9
Enrolled in remedial math courses and completed some[4]	3.2	39.0	-3.5	66.9
Enrolled in remedial math courses and completed none[4]	-12.2	23.7	-38.4	32.0 *
Did not enroll in any math remedial courses	†	*35.9*	†	*70.4*
Other characteristics as controls				
Sex				
Female	2.5	47.6	-0.1	79.4
Male	†	*45.1*	†	*79.5*
Race/ethnicity[5]				
Black	-3.9	43.6	-0.3	79.4
Hispanic	-5.9	41.6	-3.3	76.4
Asian	10.1	57.6 *	9.9	89.7 *
All other races	0.4	47.9	-7.8	71.9 *
White	†	*47.5*	†	*79.7*
Highest education of parents				
High school or less	-0.7	46.7	-4.5	76.3 *
Some college	-2.0	45.4	-1.0	79.8
Bachelor's degree or higher	†	*47.4*	†	*80.8*
Income level[6]				
Lowest 25 percent	-6.0	42.5 *	-2.6	77.5
Lower middle 25 percent	-1.8	46.7	-1.9	78.2
Upper middle 25 percent	-0.3	48.2	1.3	81.4
Highest 25 percent	†	*48.6*	†	*80.1*
Highest degree expected in 2003–04				
Bachelor's degree	6.1	44.6 *	9.5	77.3
Advanced degree	13.0	51.6 *	12.9	80.6 *
No degree/subbaccalaureate degree	†	*38.6*	†	*67.7*

See notes at end of table.

Table C-2.
REGRESSION ON EARNING COLLEGE-LEVEL MATH CREDITS: Average marginal effects of various characteristics on the probability of earning any college-level math course credits among 2003−04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted probability of attaining this outcome for various groups of students—Continued

Characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Attendance intensity in 2003–04				
Always part-time	-14.5	37.9 *	-21.0	59.8 *
Mixed	-1.0	51.4	-2.4	78.5
Always full-time	†	*52.4*	†	*80.8*
Academic integration in 2003–04				
Low	1.3	45.8	1.6	78.0
Moderate	2.7	47.1	3.6	80.1
High	†	*44.4*	†	*76.4*
Enrollment size of the institution first attended				
1,999 or fewer	3.0	46.3	5.5	87.1
2,000−4,999	7.0	50.3	-8.7	72.9
5,000−9,999	1.2	44.4	-5.5	76.1 *
10,000−14,999	7.4	50.6	-2.3	79.2
15,000 or more	†	*43.3*	†	*81.6*
Percent minority enrollment in the institution first attended				
0–10%	-0.1	45.0	-3.4	79.2
>10–20%	1.3	46.5	-6.2	76.4 *
>20–30%	0.9	46.1	-2.0	80.6
>30–40%	5.0	50.2	-1.0	81.6
>40–50%	5.8	50.9	-0.4	82.2
>50%	†	*45.1*	†	*82.6*
Selectivity of first-attended 4-year institution[7]				
Highly selective	†	†	9.8	85.8 *
Moderately selective	†	†	3.1	79.1
Minimally selective/open admission	†	†	†	*76.0*
Region of the institution first attended				
New England	5.8	44.8	7.2	82.0
Mideast	10.5	49.4	5.4	80.2
Great Lakes	3.3	42.3	1.7	76.4
Plains	9.6	48.6	7.7	82.4
Southeast	13.3	52.2 *	8.6	83.3 *
Southwest	13.0	52.0 *	7.2	82.0 *
Rocky Mountains	-2.5	36.5	-1.6	73.2
Other Jurisdictions	52.3	91.3 *	6.5	81.2
Far West	†	*39.0*	†	*74.7*

See notes at end of table.

Table C-2.
REGRESSION ON EARNING COLLEGE-LEVEL MATH CREDITS: Average marginal effects of various characteristics on the probability of earning any college-level math course credits among 2003−04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted probability of attaining this outcome for various groups of students—Continued

† Not applicable.

* $p < .05$

[1] Marginal effect measures the average percentage point change in the predicted probability of attaining an outcome associated with a one-unit change in an independent variable, after controlling for the covariation of the variables in the model.

[2] Average predicted probability of attaining an outcome after controlling for the covariation of the variables in the model.

[3] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the multinomial probit (MNP) model as an "unknown" category. See appendix A for detailed construction of this variable.

[4] Completion of a remedial course means that students earned either a passing grade or some credits in that course.

[5] Black includes African American, Hispanic includes Latino, and "All other races" includes American Indian, Alaska Native, Native Hawaiian, Other Pacific Islander, and individuals who indicated Two or more races or Other.

[6] The total income in 2003–04 for independent students or parents of dependent students.

[7] The selectivity of institution was developed only for public and private nonprofit 4-year institutions using the following criteria: whether the institution was open admission (had no minimal requirements); the number of applicants; the number of students admitted; the 25th and 75th percentiles of ACT and/or SAT scores; and whether test scores were required for admission. For more information, see Cunningham, A.F. (2006). *Changes in Patterns of Prices and Financial Aid* (NCES 2006-153). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

NOTE: F-tests for the MNP models for beginning postsecondary students at public 2- and 4-year institutions are 59.1 and 13.5, with the degree of freedom of 340 and 382, respectively ($p<0.05$). The italicized category in each variable is the comparison group. Estimates include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:2009).

Table C-3.
REGRESSION ON EARLY COLLEGE ATTRITION: Average marginal effects of various characteristics on the probability of leaving postsecondary education without a degree or certificate by the end of the second year among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted probability of attaining this outcome for various groups of students

Characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Weak academic preparation[3]				
Enrolled in remedial English/reading courses and completed all[4]	-7.0	12.4	-2.4	10.7
Enrolled in remedial English/reading courses and completed some[4]	-7.5	11.9	-7.6	5.5
Enrolled in remedial English/reading courses and completed none[4]	11.7	31.1	-3.0	10.1
Did not enroll in any English/reading remedial courses	†	*19.4*	†	*13.1*
Enrolled in remedial math courses and completed all[4]	-4.9	16.8	-10.8	4.7 *
Enrolled in remedial math courses and completed some[4]	-7.3	14.5 *	-12.6	2.9 *
Enrolled in remedial math courses and completed none[4]	-4.3	17.5	11.7	27.2 *
Did not enroll in any math remedial courses	†	*21.8*	†	*15.5*
Moderate/strong academic preparation[3]				
Enrolled in remedial English/reading courses and completed all[4]	0.2	13.2	-0.5	4.7
Enrolled in remedial English/reading courses and completed some[4]	10.2	23.2	10.9	16.0
Enrolled in remedial English/reading courses and completed none[4]	9.0	22.0	-3.1	2.0
Did not enroll in any English/reading remedial courses	†	*13.0*	†	*5.2*
Enrolled in remedial math courses and completed all[4]	-3.7	10.5	-1.4	3.4
Enrolled in remedial math courses and completed some[4]	-2.2	12.1	-0.6	4.3
Enrolled in remedial math courses and completed none[4]	10.1	24.3 *	11.4	16.2 *
Did not enroll in any math remedial courses	†	*14.2*	†	*4.8*
Unknown level of academic preparation[3]				
Enrolled in remedial English/reading courses and completed all[4]	-0.8	24.3	1.2	13.1
Enrolled in remedial English/reading courses and completed some[4]	-2.9	22.2	-11.9	0.0 *
Enrolled in remedial English/reading courses and completed none[4]	-1.2	23.9	6.5	18.4
Did not enroll in any English/reading remedial courses	†	*25.1*	†	*11.9*
Enrolled in remedial math courses and completed all[4]	-16.9	16.9 *	4.8	14.8
Enrolled in remedial math courses and completed some[4]	-18.8	14.9 *	0.4	10.3
Enrolled in remedial math courses and completed none[4]	-6.3	27.4	11.7	21.7
Did not enroll in any math remedial courses	†	*33.7*	†	*10.0*
Other characteristics as controls				
Sex				
Female	-0.5	18.2	-2.2	5.3 *
Male	†	*18.7*	†	*7.5*
Race/ethnicity[5]				
Black	-4.4	14.7 *	-4.2	3.4 *
Hispanic	2.0	21.0	-3.9	3.8 *
Asian	-10.6	8.4 *	-5.2	2.4 *
All other races	2.6	21.6	-0.2	7.5
White	†	*19.0*	†	*7.6*

See notes at end of table.

Table C-3.
REGRESSION ON EARLY COLLEGE ATTRITION: Average marginal effects of various characteristics on the probability of leaving postsecondary education without a degree or certificate by the end of the second year among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted probability of attaining this outcome for various groups of students—Continued

Characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Highest education of parents				
High school or less	3.7	19.9	8.7	11.9 *
Some college	2.2	18.3	2.8	6.0 *
Bachelor's degree or higher	†	*16.1*	†	*3.2*
Income level[6]				
Lowest 25 percent	4.5	21.3	3.0	7.7 *
Lower middle 25 percent	0.8	17.7	2.7	7.3 *
Upper middle 25 percent	1.2	18.1	0.9	5.6
Highest 25 percent	†	*16.8*	†	*4.6*
Highest degree expected in 2003–04				
Bachelor's degree	-2.4	20.6	-7.1	7.0
Advanced degree	-9.0	14.0 *	-8.6	5.6 *
No degree/subbaccalaureate degree	†	*23.0*	†	*14.2*
Attendance intensity in 2003–04				
Always part-time	4.9	21.5 *	1.3	7.4
Mixed	-2.5	14.2	0.6	6.7
Always full-time	†	*16.7*	†	*6.1*
Academic integration in 2003–04				
Low	2.7	20.7	2.9	8.1
Moderate	-1.2	16.9	0.9	6.0
High	†	*18.0*	†	*5.1*
Enrollment size of the institution first attended				
1,999 or fewer	6.2	23.1	3.5	8.8
2,000–4,999	3.6	20.5	1.5	6.8
5,000–9,999	-1.6	15.3	3.3	8.7 *
10,000–14,999	3.3	20.2	-0.9	4.4
15,000 or more	†	*16.9*	†	*5.3*
Percent minority enrollment in the institution first attended				
0–10%	-1.7	15.2	-2.3	4.8
>10–20%	7.3	24.3	-0.8	6.3
>20–30%	2.9	19.9	-0.2	6.9
>30–40%	-1.5	15.5	3.3	10.4
>40–50%	4.2	21.2	1.9	9.0
>50%	†	*17.0*	†	*7.1*
Selectivity of first-attended 4-year institution[7]				
Highly selective	†	†	-4.6	4.6 *
Moderately selective	†	†	-4.2	5.1 *
Minimally selective/open admission	†	†	†	*9.2*

See notes at end of table.

Table C-3.
REGRESSION ON EARLY COLLEGE ATTRITION: Average marginal effects of various characteristics on the probability of leaving postsecondary education without a degree or certificate by the end of the second year among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted probability of attaining this outcome for various groups of students—Continued

Characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Region of the institution first attended				
New England	-12.3	9.7 *	0.8	6.3
Mideast	-2.9	19.1	-0.2	5.3
Great Lakes	-4.0	18.0	1.8	7.2
Plains	-1.2	20.8	-1.1	4.3
Southeast	-4.3	17.7	0.7	6.2
Southwest	-6.4	15.6	0.2	5.7
Rocky Mountains	8.8	30.7	2.7	8.2
Other Jurisdictions	-22.0	0.0 *	-2.9	2.6
Far West	*†*	*22.0*	*†*	*5.5*

† Not applicable.

* $p < .05$

[1] Marginal effect measures the average percentage point change in the predicted probability of attaining an outcome associated with a one-unit change in an independent variable, after controlling for the covariation of the variables in the model.

[2] Average predicted probability of attaining an outcome after controlling for the covariation of the variables in the model.

[3] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the multinomial probit (MNP) model as an "unknown" category. See appendix A for detailed construction of this variable.

[4] Completion of a remedial course means that students earned either a passing grade or some credits in that course.

[5] Black includes African American, Hispanic includes Latino, and "All other races" includes American Indian, Alaska Native, Native Hawaiian, Other Pacific Islander, and individuals who indicated Two or more races or Other.

[6] The total income in 2003–04 for independent students or parents of dependent students.

[7] The selectivity of institution was developed only for public and private nonprofit 4-year institutions using the following criteria: whether the institution was open admission (had no minimal requirements); the number of applicants; the number of students admitted; the 25th and 75th percentiles of ACT and/or SAT scores; and whether test scores were required for admission. For more information, see Cunningham, A.F. (2006). *Changes in Patterns of Prices and Financial Aid* (NCES 2006-153). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

NOTE: F-tests for the MNP models for beginning postsecondary students at public 2- and 4-year institutions are 43.7 and 469.1, with the degree of freedom of 340 and 382, respectively ($p<0.05$). The italicized category in each variable is the comparison group. Estimates include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:2009).

Table C-4.
REGRESSION ON TRANSFER: Average marginal effects of various characteristics on the probability of transferring to a 4-year institution among 2003–04 postsecondary students beginning at public 2-year institutions, and the average predicted probability of attaining this outcome for various groups of students

Characteristics	Transferred to a 4-year institution[1]		Last enrolled in a 4-year institution	
	Average marginal effect[2]	Average predicted probability[3]	Average marginal effect[2]	Average predicted probability[3]
Weak academic preparation[4]				
Enrolled in remedial English/reading courses and completed all[5]	-1.2	24.2	-0.7	27.5
Enrolled in remedial English/reading courses and completed some[5]	5.5	30.9	1.0	29.2
Enrolled in remedial English/reading courses and completed none[5]	-9.9	15.5 *	-12.4	15.8 *
Did not enroll in any English/reading remedial courses	†	*25.4*	†	*28.2*
Enrolled in remedial math courses and completed all[5]	0.8	27.5	5.4	31.6
Enrolled in remedial math courses and completed some[5]	-4.8	21.9	-0.6	25.6
Enrolled in remedial math courses and completed none[5]	-10.1	16.6 *	-2.8	23.4
Did not enroll in any math remedial courses	†	*26.7*	†	*26.2*
Moderate/strong academic preparation[4]				
Enrolled in remedial English/reading courses and completed all[5]	-8.0	24.5 *	-7.4	29.4 *
Enrolled in remedial English/reading courses and completed some[5]	-16.1	16.5 *	-19.4	17.4 *
Enrolled in remedial English/reading courses and completed none[5]	-12.8	19.8 *	-13.6	23.2 *
Did not enroll in any English/reading remedial courses	†	*32.6*	†	*36.8*
Enrolled in remedial math courses and completed all[5]	-1.0	32.7	1.3	38.4
Enrolled in remedial math courses and completed some[5]	-12.7	21.0 *	-12.6	24.5 *
Enrolled in remedial math courses and completed none[5]	-10.9	22.8 *	-10.9	26.2 *
Did not enroll in any math remedial courses	†	*33.7*	†	*37.1*
Unknown level of academic preparation[4]				
Enrolled in remedial English/reading courses and completed all[5]	-10.1	9.2 *	-12.0	11.2 *
Enrolled in remedial English/reading courses and completed some[5]	-9.7	9.7	-14.6	8.6 *
Enrolled in remedial English/reading courses and completed none[5]	-13.4	5.9 *	-12.5	10.7 *
Did not enroll in any English/reading remedial courses	†	*19.3*	†	*23.2*
Enrolled in remedial math courses and completed all[5]	8.0	22.6 *	10.6	26.7 *
Enrolled in remedial math courses and completed some[5]	-5.2	9.4 *	-1.4	14.7
Enrolled in remedial math courses and completed none[5]	2.7	17.3	6.0	22.1
Did not enroll in any math remedial courses	†	*14.6*	†	*16.1*
Other characteristics as controls				
Sex				
Female	2.2	27.0	3.4	30.9 *
Male	†	*24.8*	†	*27.6*
Race/ethnicity[6]				
Black	-0.7	26.2	0.0	30.2
Hispanic	-4.0	22.8	-6.3	23.9 *
Asian	4.9	31.7	9.2	39.4
All other races	-6.7	20.1 *	-3.6	26.6
White	†	*26.8*	†	*30.2*

See notes at end of table.

Table C-4.
REGRESSION ON TRANSFER: Average marginal effects of various characteristics on the probability of transferring to a 4-year institution among 2003–04 postsecondary students beginning at public 2-year institutions, and the average predicted probability of attaining this outcome for various groups of students—Continued

Characteristics	Transferred to a 4-year institution[1]		Last enrolled in a 4-year institution	
	Average marginal effect[2]	Average predicted probability[3]	Average marginal effect[2]	Average predicted probability[3]
Highest education of parents				
High school or less	-7.0	23.9 *	-7.4	27.0 *
Some college	-7.4	23.5 *	-7.1	27.2 *
Bachelor's degree or higher	†	*30.9*	†	*34.4*
Income level[7]				
Lowest 25 percent	-0.7	25.8	-0.7	29.4
Lower middle 25 percent	-2.2	24.3	-2.1	28.0
Upper middle 25 percent	1.0	27.5	0.5	30.5
Highest 25 percent	†	*26.5*	†	*30.0*
Highest degree expected in 2003–04				
Bachelor's degree	9.6	25.1 *	7.4	27.0 *
Advanced degree	14.0	29.5 *	14.6	34.2 *
No degree/subbaccalaureate degree	†	*15.5*	†	*19.5*
Attendance intensity in 2003–04				
Always part-time	-11.2	18.8 *	-9.8	23.0 *
Mixed	-1.1	28.9	-0.3	32.6
Always full-time	†	*29.9*	†	*32.8*
Plan to transfer to a 4-year institution in 2003–04				
Yes	15.4	31.7 *	15.8	35.5 *
No	†	*16.3*	†	*19.7*
Academic integration in 2003–04				
Low	-9.3	23.3 *	-6.3	26.9
Moderate	-5.8	26.9	-2.8	30.5
High	†	*32.7*	†	*33.2*
Enrollment size of the institution first attended				
1,999 or fewer	-5.0	21.7	-5.5	24.3
2,000–4,999	1.5	28.2	1.3	31.1
5,000–9,999	-2.8	23.9	-0.8	29.0
10,000–14,999	3.4	30.1	2.2	32.0
15,000 or more	†	*26.7*	†	*29.8*
Percent minority enrollment in the institution first attended				
0–10%	-0.8	26.4	-1.3	29.0
>10–20%	-4.0	23.1	-5.8	24.4
>20–30%	-2.1	25.0	1.1	31.3
>30–40%	1.9	29.1	3.7	33.9
>40–50%	-0.6	26.5	0.3	30.5
>50%	†	*27.1*	†	*30.2*

See notes at end of table.

Table C-4.
REGRESSION ON TRANSFER: Average marginal effects of various characteristics on the probability of transferring to a 4-year institution among 2003–04 postsecondary students beginning at public 2-year institutions, and the average predicted probability of attaining this outcome for various groups of students—Continued

Characteristics	Transferred to a 4-year institution[1]		Last enrolled in a 4-year institution	
	Average marginal effect[2]	Average predicted probability[3]	Average marginal effect[2]	Average predicted probability[3]
Region of the institution first attended				
New England	2.9	27.1	2.2	32.7
Mideast	4.2	28.4	-0.1	30.3
Great Lakes	-0.7	23.6	-3.5	27.0
Plains	10.6	34.8 *	8.2	38.7
Southeast	3.3	27.6	-1.2	29.3
Southwest	-1.7	22.5	-5.5	24.9
Rocky Mountains	22.3	46.6 *	17.5	48.0 *
Other Jurisdictions	38.3	62.5 *	33.9	64.4 *
Far West	*†*	*24.2*	*†*	*30.5*

† Not applicable.

* $p < .05$

[1] Refers to the first transfer.

[2] Marginal effect measures the average percentage point change in the predicted probability of attaining an outcome associated with a one-unit change in an independent variable, after controlling for the covariation of the variables in the model.

[3] Average predicted probability of attaining an outcome after controlling for the covariation of the variables in the model.

[4] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the multinomial probit (MNP) model as an "unknown" category. See appendix A for detailed construction of this variable.

[5] Completion of a remedial course means that students earned either a passing grade or some credits in that course.

[6] Black includes African American, Hispanic includes Latino, and "All other races" includes American Indian, Alaska Native, Native Hawaiian, Other Pacific Islander, and individuals who indicated Two or more races or Other.

[7] The total income in 2003–04 for independent students or parents of dependent students.

NOTE: F-tests for the MNP models of these two outcome variables are 56.6 and 37.9, respectively, with the degree of freedom of 340 for both models ($p<0.05$). The italicized category in each variable is the comparison group. Estimates include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:2009).

Table C-5.
REGRESSION ON COLLEGE-LEVEL CREDITS: Average marginal effects of various characteristics on the total number of college-level credits earned through 2009 among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted total number of college-level credits earned by various groups of students

	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
Characteristics	Average marginal effect[1]	Average predicted credits[2]	Average marginal effect[1]	Average predicted credits[2]
Weak academic preparation[3]				
Enrolled in remedial English/reading courses and completed all[4]	4.1	50.5	16.2	86.7
Enrolled in remedial English/reading courses and completed some[4]	0.4	46.8	-18.7	51.7
Enrolled in remedial English/reading courses and completed none[4]	-13.9	32.5 *	-9.0	61.5
Did not enroll in any English/reading remedial courses	†	*46.4*	†	*70.4*
Enrolled in remedial math courses and completed all[4]	18.4	59.8 *	23.9	91.0 *
Enrolled in remedial math courses and completed some[4]	8.5	49.9	12.8	80.0
Enrolled in remedial math courses and completed none[4]	-18.0	23.4 *	-21.7	45.5
Did not enroll in any math remedial courses	†	*41.4*	†	*67.2*
Moderate/strong academic preparation[3]				
Enrolled in remedial English/reading courses and completed all[4]	-4.6	54.1	-8.1	98.4
Enrolled in remedial English/reading courses and completed some[4]	-25.7	33.0 *	-33.7	72.8 *
Enrolled in remedial English/reading courses and completed none[4]	-20.1	38.6 *	5.7	112.3
Did not enroll in any English/reading remedial courses	†	*58.7*	†	*106.5*
Enrolled in remedial math courses and completed all[4]	8.1	66.2	2.2	110.8
Enrolled in remedial math courses and completed some[4]	-9.4	48.7	-12.6	96.1
Enrolled in remedial math courses and completed none[4]	-26.5	31.6 *	-39.5	69.1 *
Did not enroll in any math remedial courses	†	*58.1*	†	*108.7*
Unknown level of academic preparation[3]				
Enrolled in remedial English/reading courses and completed all[4]	-7.6	40.7	3.5	93.7
Enrolled in remedial English/reading courses and completed some[4]	-17.0	31.3 *	16.9	107.1
Enrolled in remedial English/reading courses and completed none[4]	-18.3	30.0 *	52.9	143.1
Did not enroll in any English/reading remedial courses	†	*48.3*	†	*90.2*
Enrolled in remedial math courses and completed all[4]	29.9	63.9 *	-5.4	91.1
Enrolled in remedial math courses and completed some[4]	7.9	41.9	-10.0	86.5
Enrolled in remedial math courses and completed none[4]	5.9	39.9	-45.2	51.3 *
Did not enroll in any math remedial courses	†	*34.0*	†	*96.5*
Other characteristics as controls				
Sex				
Female	3.6	52.8	6.7	106.3 *
Male	†	*49.2*	†	*99.6*
Race/ethnicity[5]				
Black	-9.4	43.9 *	-2.8	100.3
Hispanic	-5.7	47.6	2.8	105.9
Asian	5.5	58.8	8.7	111.8
All other races	-5.8	47.5	-5.2	97.9
White	†	*53.3*	†	*103.1*

See notes at end of table.

Table C-5.
REGRESSION ON COLLEGE-LEVEL CREDITS: Average marginal effects of various characteristics predicting the total number of college-level credits earned through 2009 among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted total number of college-level credits earned by various groups of students—Continued

Characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Average marginal effect[1]	Average predicted credits[2]	Average marginal effect[1]	Average predicted credits[2]
Highest education of parents				
High school or less	-9.7	48.4 *	-14.8	91.8 *
Some college	-9.9	48.2 *	-0.8	105.7
Bachelor's degree or higher	†	*58.1*	†	*106.6*
Income level[6]				
Lowest 25 percent	-5.1	47.6	-11.5	97.7 *
Lower middle 25 percent	-2.7	50.0	-8.7	100.6 *
Upper middle 25 percent	2.0	54.7	-6.4	102.8 *
Highest 25 percent	†	*52.7*	†	*109.2*
Highest degree expected in 2003–04				
Bachelor's degree	-0.2	48.2	20.5	99.8 *
Advanced degree	9.7	58.1 *	25.5	104.9 *
No degree/subbaccalaureate degree	†	*48.4*	†	*79.4*
Attendance intensity in 2003–04				
Always part-time	-24.3	35.8 *	-39.8	65.6 *
Mixed	1.3	61.4	-4.6	100.8
Always full-time	†	*60.0*	†	*105.4*
Academic integration in 2003–04				
Low	-7.2	44.9	-12.9	93.0 *
Moderate	2.4	54.5	-1.3	104.6
High	†	*52.1*	†	*105.9*
Enrollment size of the institution first attended				
1,999 or fewer	0.2	47.3	0.2	106.2
2,000–4,999	8.5	55.6	-5.4	100.6
5,000–9,999	2.5	49.6	-11.5	94.5 *
10,000–14,999	11.8	58.9 *	0.8	106.8
15,000 or more	†	*47.1*	†	*106.0*
Percent minority enrollment in the institution first attended				
0–10%	2.2	50.9	4.0	107.1
>10–20%	1.1	49.9	-1.1	102.0
>20–30%	4.7	53.5	-0.8	102.3
>30–40%	4.7	53.4	-5.8	97.3
>40–50%	7.2	56.0	11.6	114.7
>50%	†	*48.7*	†	*103.1*
Selectivity of first-attended 4-year institution[7]				
Highly selective	†	†	24.0	111.9 *
Moderately selective	†	†	17.1	105.0 *
Minimally selective/open admission	†	†	†	*88.0*

See notes at end of table.

Table C-5.
REGRESSION ON COLLEGE-LEVEL CREDITS: Average marginal effects of various characteristics predicting the total number of college-level credits earned through 2009 among 2003–04 postsecondary students beginning at public 2- and 4-year institutions, and the average predicted total number of college-level credits earned by various groups of students—Continued

Characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Average marginal effect[1]	Average predicted credits[2]	Average marginal effect[1]	Average predicted credits[2]
Region of the institution first attended				
New England	8.9	55.1	-8.5	102.8
Mideast	7.2	53.4	-4.5	106.8
Great Lakes	4.6	50.8	-6.2	105.1
Plains	14.0	60.2 *	-2.5	108.8
Southeast	4.3	50.5	-12.5	98.8 *
Southwest	6.6	52.8	-8.1	103.1
Rocky Mountains	-3.6	42.6	-14.1	97.2
Other Jurisdictions	59.6	105.9 *	-15.3	96.0
Far West	*†*	*46.2*	*†*	*111.3*

† Not applicable.

* $p < .05$

[1] Marginal effect measures the change in the predicted total number of college-level credits earned associated with a one-unit change in an independent variable, after controlling for the covariation of the variables in the model.

[2] Average predicted total number of college-level credits earned through 2009 after controlling for the covariation of the variables in the model.

[3] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the negative binomial (NB) regression model as an "unknown" category. See appendix A for detailed construction of this variable.

[4] Completion of a remedial course means that students earned either a passing grade or some credits in that course.

[5] Black includes African American, Hispanic includes Latino, and "All other races" includes American Indian, Alaska Native, Native Hawaiian, Other Pacific Islander, and individuals who indicated Two or more races or Other.

[6] The total income in 2003–04 for independent students or parents of dependent students.

[7] The selectivity of institution was developed only for public and private nonprofit 4-year institutions using the following criteria: whether the institution was open admission (had no minimal requirements); the number of applicants; the number of students admitted; the 25th and 75th percentiles of ACT and/or SAT scores; and whether test scores were required for admission. For more information, see Cunningham, A.F. (2006). *Changes in Patterns of Prices and Financial Aid* (NCES 2006-153). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

NOTE: F-tests for the NB models for beginning postsecondary students at public 2- and 4-year institutions are 53.5 and 43.8, with the degree of freedom of 319 and 357, respectively ($p<0.05$). The italicized category in each variable is the comparison group. Estimates include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:2009).

Table C-6.
REGRESSION ON 6-YEAR PERSISTENCE AND ATTAINMENT: Average marginal effects of various characteristics on the probability of attaining a degree or enrolling in postsecondary education as of 2009 among 2003–04 postsecondary students beginning at public 2-year institutions, and the average predicted probability of attaining these outcomes for various groups of students

	Students beginning at public 2-year institutions					
	Did not attain a degree but were enrolled		Attained an associate's degree or certificate		Attained a bachelor's degree	
Characteristics	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Weak academic preparation[3]						
Enrolled in remedial English/reading courses and completed all[4]	2.0	24.3	2.6	25.1	-0.5	9.8
Enrolled in remedial English/reading courses and completed some[4]	10.2	32.5	-2.9	19.6	-3.3	7.0
Enrolled in remedial English/reading courses and completed none[4]	-8.1	14.2	-11.1	11.4 *	-4.4	5.9
Did not enroll in any English/reading remedial courses	†	*22.3*	†	*22.5*	†	*10.3*
Enrolled in remedial math courses and completed all[4]	0.8	22.7	3.8	23.9	2.9	13.4
Enrolled in remedial math courses and completed some[4]	3.0	24.9	8.5	28.5 *	-4.5	5.9 *
Enrolled in remedial math courses and completed none[4]	-0.8	21.1	-4.2	15.9	-6.5	3.9 *
Did not enroll in any math remedial courses	†	*21.9*	†	*20.1*	†	*10.5*
Moderate/strong academic preparation[3]						
Enrolled in remedial English/reading courses and completed all[4]	2.7	23.4	3.0	26.2	-2.1	13.7
Enrolled in remedial English/reading courses and completed some[4]	-2.6	18.2	1.4	24.6	-10.4	5.3 *
Enrolled in remedial English/reading courses and completed none[4]	3.3	24.0	4.8	28.0	-5.9	9.8
Did not enroll in any English/reading remedial courses	†	*20.7*	†	*23.3*	†	*15.7*
Enrolled in remedial math courses and completed all[4]	6.7	23.0 *	1.4	26.9	-0.6	18.4
Enrolled in remedial math courses and completed some[4]	11.6	27.9 *	-0.2	25.3	-14.4	4.7 *
Enrolled in remedial math courses and completed none[4]	8.0	24.3	-15.7	9.8 *	-13.1	5.9 *
Did not enroll in any math remedial courses	†	*16.3*	†	*25.5*	†	*19.1*
Unknown level of academic preparation[3]						
Enrolled in remedial English/reading courses and completed all[4]	4.0	20.4	-3.8	18.9	-4.7	2.6 *
Enrolled in remedial English/reading courses and completed some[4]	11.6	28.0	9.6	32.3	-6.5	0.8 *
Enrolled in remedial English/reading courses and completed none[4]	1.2	17.7	-1.7	21.1	-4.8	2.5 *
Did not enroll in any English/reading remedial courses	†	*16.5*	†	*22.8*	†	*7.3*
Enrolled in remedial math courses and completed all[4]	15.6	25.3 *	-1.4	23.1	4.5	9.7
Enrolled in remedial math courses and completed some[4]	16.2	25.8 *	-3.5	21.0	-0.7	4.6
Enrolled in remedial math courses and completed none[4]	4.3	14.0	-9.2	15.3	-4.3	0.9 *
Did not enroll in any math remedial courses	†	*9.7*	†	*24.5*	†	*5.2*

See notes at end of table.

Table C-6.
REGRESSION ON 6-YEAR PERSISTENCE AND ATTAINMENT: Average marginal effects of various characteristics on the probability of attaining a degree or enrolling in postsecondary education as of 2009 among 2003–04 postsecondary students beginning at public 2-year institutions, and the average predicted probability of attaining these outcomes for various groups of students—Continued

	Students beginning at public 2-year institutions					
	Did not attain a degree but were enrolled		Attained an associate's degree or certificate		Attained a bachelor's degree	
Characteristics	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Other characteristics as controls						
Sex						
Female	-1.8	19.4	3.7	24.4 *	3.1	13.6 *
Male	*†*	*21.3*	*†*	*20.6*	*†*	*10.5*
Race/ethnicity[5]						
Black	4.9	24.4	-3.5	20.5	-2.8	9.8
Hispanic	-2.3	17.2	-4.1	20.0	-1.7	11.0
Asian	5.6	25.2	-1.1	23.0	4.2	16.8
All other races	3.8	23.4	-1.8	22.3	-2.7	10.0
White	*†*	*19.6*	*†*	*24.1*	*†*	*12.6*
Highest education of parents						
High school or less	-2.5	19.6	3.1	23.4	-5.1	10.1 *
Some college	-2.6	19.5	4.7	24.9	-4.0	11.2 *
Bachelor's degree or higher	*†*	*22.1*	*†*	*20.3*	*†*	*15.2*
Income level[6]						
Lowest 25 percent	-0.8	18.9	-6.4	19.2 *	0.0	12.4
Lower middle 25 percent	1.6	21.3	-3.1	22.4	-0.6	11.8
Upper middle 25 percent	1.2	20.9	-1.5	24.1	-0.3	12.1
Highest 25 percent	*†*	*19.7*	*†*	*25.6*	*†*	*12.4*
Highest degree expected in 2003–04						
Bachelor's degree	3.0	19.1	-12.7	21.4 *	8.7	10.9 *
Advanced degree	7.1	23.1 *	-14.1	20.0 *	13.7	16.0 *
No degree/subbaccalaureate degree	*†*	*16.0*	*†*	*34.1*	*†*	*2.2*

See notes at end of table.

Table C-6.
REGRESSION ON 6-YEAR PERSISTENCE AND ATTAINMENT: Average marginal effects of various characteristics on the probability of attaining a degree or enrolling in postsecondary education as of 2009 among 2003−04 postsecondary students beginning at public 2-year institutions, and the average predicted probability of attaining these outcomes for various groups of students—Continued

	Students beginning at public 2-year institutions					
	Did not attain a degree but were enrolled		Attained an associate's degree or certificate		Attained a bachelor's degree	
Characteristics	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Attendance intensity in 2003–04						
Always part-time	5.3	23.0 *	-5.4	20.3 *	-7.7	6.8 *
Mixed	4.6	22.3 *	-3.4	22.3	0.3	14.8
Always full-time	†	*17.7*	†	*25.7*	†	*14.5*
Academic integration in 2003–04						
Low	5.6	21.2	-2.1	21.1	-6.0	9.4 *
Moderate	4.6	20.2	1.0	24.1	-2.3	13.2
High	†	*15.6*	†	*23.1*	†	*15.4*
Enrollment size of the institution first attended						
1,999 or fewer	-12.5	12.9 *	7.5	27.3	-1.9	10.2
2,000−4,999	-7.9	17.5 *	5.7	25.6	0.2	12.3
5,000−9,999	-4.0	21.4	1.3	21.2	-1.2	10.9
10,000−14,999	-6.7	18.7 *	1.0	20.8	6.8	18.9 *
15,000 or more	†	*25.4*	†	*19.9*	†	*12.1*
Percent minority enrollment in the institution first attended						
0–10%	-2.3	20.1	3.2	25.4	6.0	15.2 *
>10–20%	-4.2	18.2	-2.4	19.8	3.6	12.9 *
>20–30%	-4.3	18.1	0.6	22.8	4.9	14.1 *
>30–40%	1.0	23.3	-0.4	21.8	3.1	12.4
>40–50%	-3.5	18.9	3.5	25.7	-1.2	8.0
>50%	†	*22.4*	†	*22.2*	†	*9.2*

See notes at end of table.

Table C-6.
REGRESSION ON 6-YEAR PERSISTENCE AND ATTAINMENT: Average marginal effects of various characteristics on the probability of attaining a degree or enrolling in postsecondary education as of 2009 among 2003−04 postsecondary students beginning at public 2-year institutions, and the average predicted probability of attaining these outcomes for various groups of students—Continued

	Students beginning at public 2-year institutions					
	Did not attain a degree but were enrolled		Attained an associate's degree or certificate		Attained a bachelor's degree	
Characteristics	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Region of the institution first attended						
New England	9.4	27.9 *	9.4	30.5	-4.4	9.4
Mideast	-8.3	10.2 *	7.3	28.4	0.4	14.2
Great Lakes	2.4	20.9	-0.1	21.0	-3.9	9.9 *
Plains	4.6	23.1	-2.0	19.1	0.0	13.8
Southeast	4.8	23.3	3.4	24.6	-3.1	10.7
Southwest	3.5	22.1	0.8	22.0	-1.1	12.7
Rocky Mountains	-7.3	11.2 *	-12.3	8.9 *	-2.6	11.2
Other Jurisdictions	14.2	32.7 *	36.5	57.6 *	-13.8	0.0 *
Far West	*†*	*18.5*	*†*	*21.1*	*†*	*13.8*

† Not applicable.

* $p < .05$

[1] Marginal effect measures the average percentage point change in the predicted probability of attaining an outcome associated with a one-unit change in an independent variable, after controlling for the covariation of the variables in the model.

[2] Average predicted probability of attaining an outcome after controlling for the covariation of the variables in the model.

[3] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the multinomial probit (MNP) model as an "unknown" category. See appendix A for detailed construction of this variable.

[4] Completion of a remedial course means that students earned either a passing grade or some credits in that course.

[5] Black includes African American, Hispanic includes Latino, and "All other races" includes American Indian, Alaska Native, Native Hawaiian, Other Pacific Islander, and individuals who indicated Two or more races or Other.

[6] The total income in 2003–04 for independent students or parents of dependent students.

NOTE: F-test for the MNP model for beginning postsecondary students at public 2-year institutions is 486.8, with the degree of freedom of 340 ($p<0.05$). The italicized category in each variable is the comparison group. Estimates include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:2009).

Table C-7.
REGRESSION ON 6-YEAR PERSISTENCE AND ATTAINMENT: Average marginal effects of various characteristics on the probability of attaining a degree or enrolling in postsecondary education as of 2009 among 2003–04 postsecondary students beginning at public 4-year institutions, and the average predicted probability of attaining these outcomes for various groups of students

	Students beginning at public 4-year institutions					
	Did not attain a degree but were enrolled		Attained an associate's degree or certificate		Attained a bachelor's degree	
Characteristics	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Weak academic preparation[3]						
Enrolled in remedial courses and completed all[4]	-5.3	18.7	2.0	7.9	20.6	52.8 *
Enrolled in remedial courses and completed some[4]	0.8	24.7	-1.1	4.8	14.7	46.9
Enrolled in remedial courses and completed none[4]	-3.7	20.3	7.0	12.9	-11.5	20.7
Did not enroll in any remedial courses	†	*24.0*	†	*5.9*	†	*32.2*
Moderate/strong academic preparation[3]						
Enrolled in remedial courses and completed all[4]	2.4	13.3	2.7	6.8 *	-5.1	60.6 *
Enrolled in remedial courses and completed some[4]	9.2	20.0 *	4.8	8.8 *	-21.0	44.7 *
Enrolled in remedial courses and completed none[4]	5.5	16.3	4.4	8.5	-27.5	38.2 *
Did not enroll in any remedial courses	†	*10.8*	†	*4.1*	†	*65.7*
Unknown level of academic preparation[3]						
Enrolled in remedial courses and completed all[4]	11.2	14.0	0.2	5.9	1.8	41.8
Enrolled in remedial courses and completed some[4]	25.4	28.2 *	-0.8	4.9	-2.4	37.6
Enrolled in remedial courses and completed none[4]	5.0	7.8	2.7	8.4	-1.8	38.2
Did not enroll in any remedial courses	†	*2.7*	†	*5.7*	†	*40.0*

See notes at end of table.

Table C-7.
REGRESSION ON 6-YEAR PERSISTENCE AND ATTAINMENT: Average marginal effects of various characteristics on the probability of attaining a degree or enrolling in postsecondary education as of 2009 among 2003–04 postsecondary students beginning at public 4-year institutions, and the average predicted probability of attaining these outcomes for various groups of students—Continued

	Students beginning at public 4-year institutions					
	Did not attain a degree but were enrolled		Attained an associate's degree or certificate		Attained a bachelor's degree	
Characteristics	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Other characteristics as controls						
Sex						
Female	-3.4	11.6 *	-0.1	5.3	6.6	62.1 *
Male	†	*15.0*	†	*5.4*	†	*55.5*
Race/ethnicity[5]						
Black	3.9	15.7	-2.0	3.4	-1.3	58.4
Hispanic	4.7	16.4	1.5	6.9	-3.5	56.2
Asian	3.4	15.2	-2.4	3.0	5.7	65.4
All other races	4.4	16.2	2.4	7.8	-8.8	50.9 *
White	†	*11.8*	†	*5.4*	†	*59.7*
Highest education of parents						
High school or less	1.9	14.9	0.5	5.0	-8.9	53.4 *
Some college	-1.0	12.0	3.0	7.5 *	-5.3	57.0 *
Bachelor's degree or higher	†	*13.0*	†	*4.5*	†	*62.3*
Income level[6]						
Lowest 25 percent	1.9	13.9	-0.1	4.6	-13.2	52.8 *
Lower middle 25 percent	2.4	14.4	2.1	6.9	-9.9	56.1 *
Upper middle 25 percent	0.8	12.8	0.5	5.2	-7.1	58.9 *
Highest 25 percent	†	*12.0*	†	*4.7*	†	*66.0*
Highest degree expected in 2003–04						
Bachelor's degree	-1.3	14.4	-5.1	7.0	10.7	54.3
Advanced degree	-3.0	12.7	-7.6	4.5	17.5	61.0 *
No degree/subbaccalaureate degree	†	*15.8*	†	*12.1*	†	*43.6*

See notes at end of table.

Table C-7.
REGRESSION ON 6-YEAR PERSISTENCE AND ATTAINMENT: Average marginal effects of various characteristics on the probability of attaining a degree or enrolling in postsecondary education as of 2009 among 2003−04 postsecondary students beginning at public 4-year institutions, and the average predicted probability of attaining these outcomes for various groups of students—Continued

	Students beginning at public 4-year institutions					
	Did not attain a degree but were enrolled		Attained an associate's degree or certificate		Attained a bachelor's degree	
Characteristics	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Attendance intensity in 2003–04						
Always part-time	9.7	22.2 *	2.9	8.2	-27.2	33.8 *
Mixed	4.1	16.5	-0.3	4.9	-9.8	51.1 *
Always full-time	†	*12.4*	†	*5.3*	†	*61.0*
Academic integration in 2003–04						
Low	8.0	15.7 *	1.0	7.5	-9.2	52.1 *
Moderate	5.7	13.3 *	-1.7	4.8	-1.3	60.0
High	†	*7.7*	†	*6.5*	†	*61.3*
Enrollment size of the institution first attended						
1,999 or fewer	-1.0	12.2	-1.1	4.6	-7.9	53.3
2,000−4,999	-3.4	9.8	1.8	7.5	-1.1	60.1
5,000−9,999	1.0	14.2	-1.0	4.7	-7.9	53.2 *
10,000−14,999	0.7	13.9	-1.2	4.5	0.3	61.4
15,000 or more	†	*13.2*	†	*5.7*	†	*61.2*
Percent minority enrollment in the institution first attended						
0–10%	-7.7	10.1 *	3.1	7.8 *	7.2	61.1
>10–20%	-3.4	14.5	-1.1	3.7	6.6	60.4
>20–30%	-3.9	13.9	0.3	5.1	4.6	58.5
>30–40%	-7.1	10.7 *	-1.5	3.2	7.4	61.3
>40–50%	-7.8	10.0 *	1.4	6.1	-3.1	50.8
>50%	†	*17.8*	†	*4.7*	†	*53.9*
Selectivity of first-attended 4-year institution[7]						
Highly selective	-5.0	9.6 *	-3.5	4.9 *	19.4	67.3 *
Moderately selective	-0.3	14.2	-4.1	4.3 *	12.0	60.0 *
Minimally selective/open admission	†	*14.6*	†	*8.4*	†	*47.9*

See notes at end of table.

Table C-7.
REGRESSION ON 6-YEAR PERSISTENCE AND ATTAINMENT: Average marginal effects of various characteristics on the probability of attaining a degree or enrolling in postsecondary education as of 2009 among 2003−04 postsecondary students beginning at public 4-year institutions, and the average predicted probability of attaining these outcomes for various groups of students—Continued

	Students beginning at public 4-year institutions					
	Did not attain a degree but were enrolled		Attained an associate's degree or certificate		Attained a bachelor's degree	
Characteristics	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]	Average marginal effect[1]	Average predicted probability[2]
Region of the institution first attended						
New England	-1.1	12.9	-0.8	3.4	-1.9	62.0
Mideast	-5.2	8.8	1.5	5.7	0.1	64.0
Great Lakes	0.6	14.6	0.6	4.8	-7.0	56.9 *
Plains	-2.0	12.0	3.4	7.6	-1.6	62.3
Southeast	-0.9	13.1	3.0	7.1 *	-6.9	57.0
Southwest	-1.2	12.8	0.1	4.3	-4.6	59.2
Rocky Mountains	1.7	15.7	0.1	4.3	-10.6	53.3
Other Jurisdictions	-0.1	13.9	-0.9	3.3	-3.6	60.3
Far West	*†*	*14.0*	*†*	*4.2*	*†*	*63.9*

† Not applicable.
* $p < .05$

[1] Marginal effect measures the average percentage point change in the predicted probability of attaining an outcome associated with a one-unit change in an independent variable, after controlling for the covariation of the variables in the model.

[2] Average predicted probability of attaining an outcome after controlling for the covariation of the variables in the model.

[3] This was derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24. Those age 24 or above (about 13 percent of the study sample) are included in the multinomial probit (MNP) model as an "unknown" category. See appendix A for detailed construction of this variable.

[4] Completion of a remedial course means that students earned either a passing grade or some credits in that course.

[5] Black includes African American, Hispanic includes Latino, and "All other races" includes American Indian, Alaska Native, Native Hawaiian, Other Pacific Islander, and individuals who indicated Two or more races or Other.

[6] The total income in 2003–04 for independent students or parents of dependent students.

[7] The selectivity of institution was developed only for public and private nonprofit 4-year institutions using the following criteria: whether the institution was open admission (had no minimal requirements); the number of applicants; the number of students admitted; the 25th and 75th percentiles of ACT and/or SAT scores; and whether test scores were required for admission. For more information, see Cunningham, A.F. (2006). *Changes in Patterns of Prices and Financial Aid* (NCES 2006-153). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

NOTE: F-test for the MNP model for beginning postsecondary students at public 4-year institutions is 17.0, with the degree of freedom of 382 ($p<0.05$). The italicized category in each variable is the comparison group. Estimates include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:2009).

Appendix D—Classification of Remedial and College-Level English and Mathematics Courses in BPS:04/09

BPS:04/09's 2009 Postsecondary Education Transcript Study (PETS:09) collected information on all courses (e.g., course titles, credits, grades) that sample members attempted during their enrollment from 2003 to 2009. The PETS course codes in BPS:04/09 were based on the 2010 Classification of Instructional Programs (CIP). If no equivalents existed in the CIP, the 2003 College Course Map (CCM) was used (Wine, Janson, and Wheeless 2011). The CCM taxonomy has a similar course coding structure as the CIP and was originally developed through extensive transcript analysis and with input from expert advisors, including postsecondary faculty familiar with the fields of study (Bryan 2012).

Transcript keying and coding for BPS:04/09's PETS:09 was performed by a team of specially trained data entry staff using a web-based data entry application (Wine, Janson, and Wheeless 2011). When a text string with the course title was entered, a keyword search based on the course title was conducted on the underlying database allowing the keyer/coder staff to select the best option from a list of possible course options returned from the database. If the course title did not adequately capture the description of the course in the institution catalog, keyer/coder staff searched the course coder database using keywords found in the course description in the institution course catalog. A series of quality control procedures were performed, including key-rekey and expert coder procedures to ensure reliability and agreement among coders.

All PETS course codes in the transcript data file are represented by 6 digits: the first 2 digits indicate the most general category; the first 4 digits narrow the focus to a subcategory; and the complete 6-digit code provides the most specific definition of the subject. The section below lists all the remedial courses considered in this study and provides their course title, 6-digit PETS code, and content description derived from Bryan (2012). A list of college-level English and math courses, along with corresponding PETS codes, is also provided below.

Remedial Courses

Remedial English/Reading Courses

Business English and/or Punctuation (23.1397): Any rhetoric and composition/writing studies course that deals with the topics of business English and/or punctuation.

Basic Reading, Reading Improvement, Reading Skills or Comprehension (23.9988): Any other English language and literature/letters course that deals with the topics of basic reading, reading improvement, reading skills and/or reading comprehension.

Basic Skills English, Language Skills, Writing Skills, Grammar, Punctuation, Spelling, Elementary Communication (23.9989): Any other English language literature/letters course that deals with the topics of basic skills English, language skills, writing skills, grammar, punctuation, spelling and/or elementary communication.

Developmental/Remedial English (32.0108): A course that focuses on the fundamental knowledge and skills in reading, writing and speaking that individuals need to function productively in society. Examples include developmental/remedial reading and writing; developmental/remedial literacy skills; literacy and communication skills.

Remedial Math Courses

Descriptive Geometry, Precollegiate Geometry, or Plane Geometry (27.0195): Any mathematics course that deals with the topic of descriptive geometry, precollegiate geometry and/or plane geometry.

Arithmetic (27.0196): Any mathematics course that deals with the topic of arithmetic.

Intermediate Algebra, Precollegiate Algebra, Elementary Algebra, Basic Algebra, Preparatory Algebra, or Pre-Algebra Math (27.0197): Any mathematics course that deals with the topic of intermediate algebra, precollegiate algebra, elementary algebra, basic algebra, preparatory algebra and/or pre-algebra math.

Precollegiate Math General, Basic Concepts of Math, Elementary Math, Introductory Math, Developmental Math and/or Preparatory Math (27.0198): Any mathematics course that deals with the topics of precollegiate math general, basic concepts of math, elementary math, introductory math, developmental math and/or preparatory math.

Business Math, Precollegiate Math, Business Computations, Business Arithmetic and/or Consumer Math (27.9990): Any other mathematics and statistics course that deals with the topics of business math, precollegiate business math, business computations, business arithmetic and/or consumer math.

Developmental/Remedial Mathematics (32.0104): A course that focuses on the development of computing and other mathematical reasoning abilities and skills. Examples include numeracy and computational skills; or adult developmental mathematics.

Other Remedial Courses

Multi/interdisciplinary Study: Basic Science Skills or Remedial Science (30.9997): Any multi/interdisciplinary studies course that deals with topics of basic science skills and/or remedial science.

Basic Skills and Developmental/Remedial Education, General (32.0101): A general course that focuses on the fundamental knowledge and skills that individuals need to function productively in society. Also student development, developmental skills, adult basic education, and/or development of competence. Examples include basic skills, general; developmental education, general; remedial education, general; adult developmental education.

Second Language Learning (32.0109): A course that focuses on the development of proficiency in reading, writing, and speaking a language or languages other than the mother tongue that are needed to perform day-to-day tasks. Includes instruction in the use of basic communication skills to develop and transmit ideas and thoughts. Examples include English as a second language.

Workplace Skills, Job Skills, Workplace Demeanor, Work Habits (32.0196): Any basic skills course that deals with the topics of workplace skills, job skills, workplace demeanor and/or work habits.

Individuals in Transition, Survival Skills, Support Skills, Out-of-Class Skills (32.0198): Any parks, recreation, leisure, and fitness studies course that deals with topics of individuals in transition, survival skills, support skills, and/or out of class skills.

Other Basic Skills and Developmental/Remedial Education (32.0199): Any course in basic skills not listed above.

Remedial Speech, Basic Speech, Basic Oral Communication, Basic Oral Skills and/or Listening Skills (23.9987): Any other English language and literature/letters course that deals with the topics of remedial speech, basic speech, basic oral communication, basic oral skills and/or listening skills.

College-Level English and Math Courses

College-Level English Courses

English Language and Literature, General (23.0101)

Writing, General (23.1301)

Creative Writing (23.1302)

Professional, Technical, Business, and Scientific Writing (23.1303)

Rhetoric and Composition (23.1304)

Spoken English, Written English, Advanced Grammar, Grammar and Reading, Grammar and Usage and/or Word Origins (23.1398)

Rhetoric and Composition/Writing Studies, Other (23.1399)
General Literature (23.1401)
American Literature (American) (23.1402)
American Literature (Canadian) (23.1403)
English Literature (British and Commonwealth) (23.1404)
Children's and Adolescent Literature (23.1405)
Shakespeare (23.1497)
Afro-American Literature, Afro-American Fiction, Afro-American Drama, Afro-American (23.1498)
Literature, Other (23.1499)
World Literature (23.9984)
Literature and Film and/or Film as Literature (23.9985)
Science Fiction and/or Fantasy (23.9986)
Literary Criticism, Literary History, Literary Theory, Research Methods, Bibliography (23.9990)
Advanced Composition, Argumentative Writing and/or Advanced Essay (23.9991)
Writing in the Disciplines, Writing in Organizations and/or Academic Writing (23.9992)
Writing Proficiency Exams, English Proficiency Exams, Writing Competency, Placement Exams and/or English Composition Exams (23.9993)
Non-Western Literature and/or Third World Literature in Translation (23.9994)
Bible as Literature, Poetry of the Old Testament, Life and Language of the Bible, Bible History and Literature and/or Literature of the Old/New Testament (23.9995)
Non-Fiction Prose, Biographies and/or Essays (23.9996)
Introduction to Fiction General, Short Story, Short Fiction and/or Novella (23.9997)
Introduction to Poetry General, Epic Poetry, Lyric Poetry and/or Narrative Poetry (23.9998)
English Language and Literature/Letters, Other (23.9999)

College-Level Math Courses

Mathematics, General (27.0101)
Algebra and Number Theory (27.0102)
Geometry/Geometric Analysis (27.0104)
Mathematics, Other (27.0199)
Applied Mathematics, General (27.0301)
Computational Mathematics (27.0303)
Applied Mathematics, Other (27.0399)
Number Systems, Number Structures, Mathematical Structures, Algebra for Teachers, Geometry for Teachers (27.9988)
Collegiate Business Math, Math for Business, Math for Economics, Math Accounting, Business Algebra (27.9989)
Technical Math: Using Scientific Calculators (27.9991)

Math Appreciation, Mathematics in Society, Math in the Modern World, Uses of Math, Cultural Mathematic and/or Survey of Mathematical Thought (27.9992)

Technical Math, Vocational Math, Physical Measurements, Merchandising Math, Nursing Math, Shop Math and/or Math for Electronics (27.9993)

Trigonometry (27.9997)

Math for Behavior, Math for Economics, Math for Social Science, Contemporary Math (27.9998)

Educational Statistics and Research Methods (13.0603)

Biometry/Biometrics (26.1101)

Biostatistics (26.1102)

Financial Mathematics (27.0305)

Statistics, General (27.0501)

Mathematical Statistics and Probability (27.0502)

Mathematics and Statistics (27.0503)

Statistics, Other (27.0599)

Mathematics and Statistics, Other (27.9999)

Psychometrics and Quantitative Psychology (42.2708)

Econometrics and Quantitative Economics (45.0603)

Social Statistics, Statistics for Social Sciences, Quantitative Research in Social Science (45.9998)

Business Statistics (52.1302)

Analysis and Functional Analysis (27.0103)

Topology and Foundations (27.0105)

Computational and Applied Mathematics (27.0304)

Mathematical Biology (27.0306)

Advanced Statistics, Regression, ANOVA, Path Analysis and/or Statistical Models (27.0598)

Advanced Mathematics Topics, Abstract Algebra, Advanced Analysis, Game Theory, Modern Algebra Structures, Real Analysis, Advanced Calculus, Vector Analysis, History of Mathematics/Fourier Analysis (27.9994)

Calculus I, Calculus II, Calculus III, Calculus IV, Calculus for Life Science, Calculus for Economics, Calculus for Business, Calculus for Technology, Applied Calculus, Calculus for Decision-Making, Survey of Calculus (27.9995)

Engineering Mathematics, Engineering Statistics, Engineering Computations, Engineering Analysis (14.9995)

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Appendix E—Standard Error Tables

Table E-1.
Standard errors for table 1: REMEDIAL COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who took remedial courses in various fields, and of those students, average number of remedial courses taken: 2003−09

Remedial coursetaking	Students beginning at public 2-year institutions	Students beginning at public 4-year institutions
Percent taking remedial courses in any field	1.47	1.75
Percent taking two or more remedial courses	1.51	1.51
Percent taking remedial English/reading	1.36	1.40
Percent taking remedial math	1.58	1.80
Percent taking remedial courses across multiple subject areas	1.29	1.36
Average number of remedial courses taken	0.08	0.08

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table E-2.
Standard errors for table 2: REMEDIAL COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who took remedial courses in any field, and of those students, average number of remedial courses taken, by selected characteristics: 2003−09

Selected characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Percent taking remedial courses in any field	Average number of remedial courses taken	Percent taking remedial courses in any field	Average number of remedial courses taken
Total	**1.47**	**0.08**	**1.75**	**0.08**
Sex				
Male	1.98	0.09	2.03	0.11
Female	1.62	0.11	2.10	0.09
Race/ethnicity				
White	1.92	0.07	1.95	0.08
Black	2.75	0.14	4.77	0.33
Hispanic	2.55	0.30	3.16	0.21
Asian	5.19	0.38	3.71	0.27
All other races	4.09	0.19	4.66	0.54
Age in 2003–04				
18 or younger	1.74	0.09	2.11	0.08
19	2.15	0.11	2.03	0.09
20–23	2.73	0.12	4.74	0.26
24 or older	2.54	0.24	6.03	0.49
Highest education of parents				
High school or less	2.04	0.15	3.05	0.12
Some college	1.76	0.10	2.86	0.16
Bachelor's degree or higher	2.20	0.10	1.62	0.08
Income level				
Lowest 25 percent	1.93	0.19	3.14	0.14
Lower middle 25 percent	2.48	0.08	2.95	0.13
Upper middle 25 percent	2.22	0.10	2.34	0.11
Highest 25 percent	2.72	0.13	1.99	0.15
Precollege academic preparation				
Unknown	2.54	0.24	6.03	0.49
Weak	2.04	0.11	4.65	0.18
Moderate	1.72	0.08	2.14	0.08
Strong	6.05	0.28	1.26	0.07
Selectivity of first-attended 4-year institution				
Very selective	†	†	4.30	0.11
Moderately selective	†	†	2.34	0.11
Minimally selective	†	†	4.20	0.16

† Not applicable.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table E-3.
Standard errors for table 3: REMEDIAL COURSE COMPLETION STATUS: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions and took remedial courses, percentage distribution of their remedial course completion status, by number of remedial courses taken and precollege academic preparation: 2003−09

Number of remedial courses taken and precollege academic preparation	Students beginning at public 2-year institutions			Students beginning at public 4-year institutions		
	Completed all	Completed some	Completed none	Completed all	Completed some	Completed none
Total	**1.77**	**1.47**	**1.31**	**2.28**	**1.77**	**1.66**
Number of remedial courses taken						
One	2.19	†	2.19	2.10	†	2.10
Two	3.37	2.42	2.36	4.04	3.73	3.18
Three	4.15	4.34	2.00	5.13	4.86	4.49
Four or more	2.29	2.32	1.80	3.55	3.54	1.89
Precollege academic preparation						
Unknown	2.96	2.95	2.24	6.41	7.24	4.42
Weak	2.93	2.40	2.12	5.02	4.65	3.44
Moderate	1.92	1.89	1.52	2.87	2.00	2.14
Strong	11.45	10.19	11.42	3.67	2.21	2.97

† Not applicable.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table E-4.
Standard errors for table 4: COLLEGE-LEVEL ENGLISH COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who enrolled and earned any credits in college-level English courses, by remedial English/reading course enrollment and completion status: 2003−09

Remedial English/reading course enrollment and completion status	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Enrolled in college-level English courses	Earned college-level English credits	Enrolled in college-level English courses	Earned college-level English credits
Total	**1.38**	**1.49**	**0.60**	**0.67**
Enrolled in remedial English/reading courses	2.39	2.83	2.12	2.66
Completed all	2.32	2.67	1.74	2.74
Completed some	6.02	5.79	6.44	7.02
Completed none	6.08	6.25	7.29	8.45
Did not enroll in remedial English/reading course	1.67	1.81	0.62	0.69

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table E-5.
Standard errors for table 5: COLLEGE-LEVEL MATH COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who enrolled and earned any credits in college-level math courses, by remedial math course enrollment and completion status: 2003−09

Remedial math course enrollment and completion status	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Enrolled in college-level math courses	Earned college-level math credits	Enrolled in college-level math courses	Earned college-level math credits
Total	**1.38**	**1.32**	**1.11**	**1.17**
Enrolled in remedial math courses	1.75	1.58	2.03	2.25
Completed all	2.20	2.05	2.28	2.26
Completed some	3.19	2.78	4.65	4.13
Completed none	3.78	2.56	6.31	6.31
Did not enroll in remedial math course	2.13	2.07	1.10	1.10

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table E-6.
Standard errors for table 6: TRANSFER: Among 2003–04 beginning postsecondary students who first enrolled in public 2-year institutions, percentage who have transferred to or attended a 4-year institution through 2009, by remedial course enrollment and completion status: 2003−09

Remedial course enrollment and completion status	First transfer was to a 4-year institution			Last institution enrolled was a 4-year institution			Ever attended a 4-year institution		
	All students	Students who planned to transfer	Students who expected to earn a bachelor's or higher degree	All students	Students who planned to transfer	Students who expected to earn a bachelor's or higher degree	All students	Students who planned to transfer	Students who expected to earn a bachelor's or higher degree
Total	**1.07**	**1.60**	**1.22**	**1.14**	**1.65**	**1.24**	**1.31**	**1.80**	**1.40**
Enrolled in remedial courses	1.24	2.04	1.55	1.36	2.13	1.62	1.51	2.21	1.78
Completed all	1.74	2.84	2.19	1.92	2.86	2.27	2.02	2.88	2.35
Completed some	1.58	2.26	1.86	1.76	2.48	2.02	2.04	2.71	2.35
Completed none	2.39	4.27	2.78	2.61	4.35	3.08	2.82	4.58	3.17
Did not enroll in remedial course	1.87	2.50	1.96	2.00	2.85	2.16	2.04	2.50	2.09

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table E-7.
Standard errors for table 7: ACCUMULATION OF COLLEGE CREDITS: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, total number of credits earned in the first year and through 2009, by remedial course enrollment and completion status: 2003−09

Remedial course enrollment and completion status	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Total credits earned in the first year	Total credits earned through 2009	Total credits earned in the first year	Total credits earned through 2009
Total	**0.30**	**1.31**	**0.31**	**1.44**
Enrolled in remedial courses	0.39	1.59	0.48	2.10
Completed all	0.41	1.68	0.51	2.09
Completed some	0.56	2.52	0.82	4.82
Completed none	0.72	2.87	1.53	6.92
Did not enroll in remedial course	0.55	2.22	0.26	1.61

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table E-8.
Standard errors for table 8: COMPARISON OF REMEDIAL AND NONREMEDIAL STUDENTS: Difference in selected characteristics between remedial and nonremedial students beginning at public 2- and 4-year institutions in 2003–04

Selected characteristics	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	Remedial students	Nonremedial students	Remedial students	Nonremedial students
Female (%)	1.48	1.82	1.80	1.36
Black (%)	1.39	1.41	3.10	0.64
Hispanic (%)	1.38	1.42	1.18	0.71
Parents with a high school education or less (%)	1.51	2.15	1.77	0.98
Income level in the lowest 25 percent (%)	1.14	1.70	1.44	1.02
Weakly prepared for college (%)	1.38	1.69	1.75	0.70
Expected to complete a bachelor's degree (%)	1.45	1.69	1.75	0.92
Expected to complete a master's or higher degree (%)	1.36	2.30	1.88	0.93
Attended the first institution part time (%)	1.22	2.01	0.88	0.61
First institution was the least selective 4-year institution (%)	†	†	4.09	2.10
Low level of academic integration in the first institution (%)	1.42	2.09	1.66	0.79
Average enrollment size of the first institution	578.59	569.52	563.39	454.19
Average percentage of minority students in the first institution	1.74	2.16	2.75	0.86

† Not applicable.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), and Postsecondary Education Transcript Study of 2009 (PETS:09).

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Appendix F—Figure Estimates and Standard Errors

Table F-1.
Estimates and standard errors for figure 1: REMEDIAL COURSETAKING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who took remedial courses in various fields, by precollege academic preparation: 2003−09

	Students beginning at public 2-year institutions			Students beginning at public 4-year institutions		
Precollege academic preparation	Percent taking remedial courses in any field	Percent taking remedial English/ reading	Percent taking remedial math	Percent taking remedial courses in any field	Percent taking remedial English/ reading	Percent taking remedial math
			Estimates			
Weakly prepared	75.3	36.4	65.0	76.7	31.0	67.2
Moderately prepared	68.8	26.0	60.5	41.8	10.3	34.5
Strongly prepared	48.3	17.8 !	39.6	18.3	2.6	12.9
			Standard errors			
Weakly prepared	2.04	2.28	2.50	4.65	4.63	4.72
Moderately prepared	1.72	1.75	1.85	2.14	1.64	2.14
Strongly prepared	6.05	6.66	6.76	1.26	0.53	1.25

! Interpret data with caution. Estimate is unstable because the standard error represents more than 30 percent of the estimate.
NOTE: Precollege academic preparation is a composite measure derived from three precollege indicators: high school GPA, the highest mathematics course taken in high school, and college admission test scores (ACT or SAT). Information for this variable is only available for students under age 24 (87 percent of the study sample). See appendix A for a detailed construction of this variable. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table F-2.
Estimates and standard errors for figure 2: REMEDIAL COURSETAKING TIMING: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions and took remedial courses, percentage distribution of students according to their first remedial course enrollment time: 2003−09

	Students beginning at public 2-year institutions		Students beginning at public 4-year institutions	
	During the first term	After the first term	During the first term	After the first term
		Estimates		
First remedial course in any field	72.2	27.8	66.8	33.2
First remedial English/reading	73.9	26.1	71.4	28.6
First remedial mathematics	65.3	34.7	65.2	34.8
		Standard errors		
First remedial course in any field	1.67	1.67	2.13	2.13
First remedial English/reading	2.12	2.12	3.65	3.65
First remedial mathematics	1.75	1.75	2.41	2.41

NOTE: “First term” is defined as the first 3 months after initial postsecondary entry. Detail may not sum to totals because of rounding. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table F-3.
Estimates and standard errors for figure 3: REMEDIAL COURSE COMPLETION STATUS: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions and took remedial courses, percentage distribution of students according to their remedial course completion status in various fields: 2003−09

	Students beginning at public 2-year institutions			Students beginning at public 4-year institutions		
	Completed all	Completed some	Completed none	Completed all	Completed some	Completed none
			Estimates			
Remedial courses in any field	49.3	34.6	16.1	59.3	25.3	15.4
Remedial English/reading	63.1	15.7	21.3	63.8	15.3	20.8
Remedial mathematics	50.5	29.4	20.1	58.2	22.0	19.8
			Standard errors			
Remedial courses in any field	1.77	1.47	1.31	2.28	1.77	1.66
Remedial English/reading	2.73	1.60	2.22	5.55	2.80	4.23
Remedial mathematics	1.80	1.48	1.51	2.47	1.72	2.12

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Detail may not sum to totals because of rounding. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table F-4.
Estimates and standard errors for figure 4: TRANSFER PLANS AND POSTSECONDARY EXPECTATIONS: Among 2003–04 beginning postsecondary students who first enrolled in public 2-year institutions, percentage who expected to earn a bachelor's or higher degree or planned to transfer to a 4-year institution, by remedial course enrollment status: 2003−04

Remedial course enrollment status	Expected to earn a bachelor's or higher degree	Planned to transfer to a 4-year institution
	Estimates	
All students	81.5	55.1
Students who enrolled in one or more remedial courses	84.2	57.7
Students who did not enroll in any remedial course	75.9	49.5
	Standard errors	
All students	1.08	1.50
Students who enrolled in one or more remedial courses	1.06	1.56
Students who did not enroll in any remedial course	2.18	2.43

NOTE: Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table F-5.
Estimates and standard errors for figure 5: COLLEGE ATTRITION: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, percentage who had left postsecondary education without a degree or certificate by the end of each academic year and had not returned as of 2009, by remedial course enrollment and completion status: 2003−09

Remedial course enrollment and completion status	Left by 2003−04	Left by 2004−05	Left by 2005−06	Left by 2006−07	Left by 2007−08	Left by 2008−09
			Estimates			
Students beginning at public 2-year institutions						
Remedial completers	5.7	12.3	21.9	27.3	32.0	35.3
Partial remedial completers	7.9	14.2	26.1	33.9	41.9	46.7
Remedial noncompleters	19.7	28.3	40.2	48.0	59.2	66.8
Nonremedial students	19.2	25.8	33.3	38.3	43.2	47.0
Students beginning at public 4-year institutions						
Remedial completers	2.8	5.8	10.9	14.9	19.7	22.2
Partial remedial completers	2.3 !	9.3	15.9	21.8	30.1	33.5
Remedial noncompleters	12.8 !	21.0	27.0	34.6	41.3	44.2
Nonremedial students	2.6	4.7	8.7	11.8	16.9	18.7
			Standard errors			
Students beginning at public 2-year institutions						
Remedial completers	0.92	1.39	1.63	1.61	1.73	1.95
Partial remedial completers	1.44	1.83	2.16	2.20	2.74	2.34
Remedial noncompleters	3.18	3.01	3.26	3.62	3.50	2.95
Nonremedial students	1.83	1.75	1.70	1.82	1.85	1.76
Students beginning at public 4-year institutions						
Remedial completers	0.84	1.10	1.44	1.46	1.51	1.53
Partial remedial completers	1.01	2.61	2.87	2.84	3.22	3.49
Remedial noncompleters	4.97	5.60	5.35	5.25	5.27	5.18
Nonremedial students	0.52	0.64	0.85	0.97	1.15	1.16

! Interpret data with caution. Estimate is unstable because the standard error represents more than 30 percent of the estimate.
NOTE: “Left by 2008−09” means left by the interview time in spring 2009. Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table F-6.
Estimates and standard errors for figure 6: COLLEGE-LEVEL COURSE CREDITS: Among 2003–04 beginning postsecondary students who first enrolled in public 2- and 4-year institutions, average total number of college-level course credits earned through 2009, by remedial course enrollment and completion status: 2003−09

Remedial course enrollment and completion status	Students beginning at public 2-year institutions	Students beginning at public 4-year institutions
	Estimates	
Remedial completers	63.8	103.9
Partial remedial completers	42.0	76.1
Remedial noncompleters	28.0	66.8
Nonremedial students	50.6	110.5
	Standard errors	
Remedial completers	1.74	2.07
Partial remedial completers	2.45	4.63
Remedial noncompleters	2.71	6.86
Nonremedial students	2.22	1.61

NOTE: College-level course credits do not include any remedial course credits. Completion of a remedial course means that students earned either a passing grade or some credits in that course. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).

Table F-7.
Estimates and standard errors for figure 7: SIX-YEAR PERSISTENCE AND ATTAINMENT: Among 2003–04 beginning postsecondary students who first enrolled in public 2- or 4-year institutions, percentage distribution of students according to their postsecondary persistence and highest degree attainment as of 2009, by remedial course enrollment and completion status: 2003−09

Remedial course enrollment and completion status	No degree and not enrolled	No degree but enrolled	Attained an associate's degree or certificate	Attained a bachelor's degree
		Estimates		
Students beginning at public 2-year institutions				
Remedial completers	35.3	22.1	25.8	16.8
Partial remedial completers	46.7	27.0	22.2	4.2
Remedial noncompleters	66.8	17.5	11.5	4.2
Nonremedial students	47.0	14.1	24.1	14.8
Students beginning at public 4-year institutions				
Remedial completers	22.2	15.7	7.0	55.1
Partial remedial completers	33.5	24.3	9.4	32.7
Remedial noncompleters	44.2	16.5	9.1	30.2
Nonremedial students	18.7	10.1	3.9	67.3
		Standard errors		
Students beginning at public 2-year institutions				
Remedial completers	1.95	1.97	1.54	1.38
Partial remedial completers	2.34	2.10	1.77	0.69
Remedial noncompleters	2.95	2.30	2.11	0.94
Nonremedial students	1.76	1.38	1.75	1.47
Students beginning at public 4-year institutions				
Remedial completers	1.53	1.46	0.99	2.11
Partial remedial completers	3.49	2.85	2.30	3.68
Remedial noncompleters	5.18	4.10	2.33	3.92
Nonremedial students	1.16	0.87	0.48	1.48

NOTE: Completion of a remedial course means that students earned either a passing grade or some credits in that course. Detail may not sum to totals because of rounding. Estimates in this figure include students enrolled in Title IV eligible postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003/04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09) and Postsecondary Education Transcript Study of 2009 (PETS:09).