



Predicting early college success for Indiana's high school class of 2014

Elisabeth Davis

Nicole Guarino

Jim Lindsay

American Institutes for Research

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REL Midwest at
American Institutes for Research
10 South Riverside Plaza, Suite 600
Chicago, IL 60606
RELMidwest@air.org



Summary

Indiana policymakers have undertaken multiple efforts to promote success among high school graduates during their early college years (Indiana Commission for Higher Education, 2008, 2012). Such efforts include developing indicators of college readiness (Indiana Commission for Higher Education, 2008), developing a more rigorous high school curriculum (Indiana Code 20-32-4-1.5, 2017), and developing a new process for determining whether students enrolled in two-year colleges need to take remedial courses (Indiana Commission for Higher Education, 2008). In 2017, the Indiana Commission for Higher Education and the Indiana Department of Education, working with Indiana's Management Performance Hub, expressed an urgent need for additional information to complement these efforts. Specifically, these agencies requested that the Regional Educational Laboratory Midwest (REL Midwest) use merged student data from their K-12 and postsecondary data systems to examine the early college success of Indiana's 2014 high school graduates who entered Indiana public colleges, identify measures that predict early college success, and examine the role of Pell Grants and 21st Century Scholarships in students' early college success. The findings from this study will help these agencies and the Indiana legislature better support the college and career readiness of Indiana youth.

In spring 2014, 71,487 high school students graduated from Indiana public and private high schools, and 28,525 of those students (or 40 percent of the high school graduates) entered Indiana two- or four-year public colleges in the fall after high school graduation. The early college success for these students was defined using three measures plus a composite of those measures: whether students took only nonremedial coursework in their first semester of college, whether they earned all attempted credits in their first semester of college, and whether they persisted to a second year of college. If students were classified as "yes" on all three measures, they also were classified as "yes" on the composite measure. Otherwise, they were classified as "no" on the composite measure. In collaboration with the Management Performance Hub, REL Midwest analysts used student demographic, academic, and financial aid variables to address the following research questions:

- Among the 2014 cohort of Indiana high school graduates enrolling in Indiana public two- or four-year colleges, what percentage of students achieved early college success, and how do those percentages vary by student demographic and academic characteristics; school-level demographic and academic characteristics; and whether students received Pell Grants, 21st Century Scholarships, or other forms of financial aid?
- What is the relationship between receiving aid and early college success, controlling for other student- and school-level characteristics?

Analysis of the 2014 cohort of Indiana high school graduates entering Indiana public two- or four-year colleges revealed three main findings related to student and school characteristics associated with early college success:

- The majority (84 percent) of 2014 Indiana high school graduates enrolling in Indiana public colleges received some form of financial aid. Most students entering two-year colleges (58 percent) received Pell Grants versus those entering four-year colleges (36 percent). Smaller percentages of students at two- and four-year colleges received 21st Century Scholarships (16 percent versus 21 percent, respectively).
- The majority of 2014 high school graduates who entered Indiana public colleges achieved early college success by most indicators of success. These rates of student success, however, varied by institution type, student demographic and academic characteristics, and the characteristics of the high schools from which students graduated.
- Early college success rates also varied by the types of financial aid students received. After controlling for other student- and school-level variables, recipients of Pell Grants were less likely to earn all attempted credits, persist to a second year, and achieve success by all indicators for both two- and four-year college students. Conversely, 21st Century Scholarship recipients entering two- and four-year colleges were more likely to persist to a second year of college.

The results from this study will help state practitioners and policymakers better identify and provide resources for students who may be at risk of not succeeding in college. In addition, these findings raise several considerations related to early college success for students from disadvantaged backgrounds and those who receive Pell grants.

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Why this study?

Economic growth and prosperity increasingly require a workforce with a postsecondary education (Carnevale, Smith, & Strohl, 2010). Almost all high school students plan to attend college (Ingels, Planty, & Bozick, 2005; Molefe, Burke, Collins, Sparks, & Hoyer, 2017), but not all students with college plans apply for, enter, or complete college. Overall, less than 60 percent of students who enter college attain postsecondary credentials. For full-time degree seekers attending college in 2007, 59 percent eventually earned bachelor's degrees. For students enrolled in two-year colleges in 2011, 28 percent were able to complete certificates or associate degrees within 150 percent of the normal time (National Center for Education Statistics [NCES], 2016, table 326). Faced with this gap between college plans and college completion, states and high schools are seeking to better identify—and, ultimately, prepare—students who may not be ready to succeed in college.

In Indiana, multiple efforts have been enacted to promote college enrollment and completion among high school students. These efforts include increasing the rigor of the high school curriculum, first by developing the Core 40 curriculum (Indiana Department of Education, 2012) and, more recently, by developing graduation pathways that focus on the skills that students need after high school (Indiana Code 20-32-4-1.5, 2017). In 2006, Indiana's legislature also passed a law that required all high schools to offer at least two dual-enrollment courses and two Advanced Placement (AP) courses (Indiana Code 20-30-10-4, 2006). In 2013, another law was passed that required schools to identify students who will need remedial education when they enroll in college (Indiana Code 20-32-9, 2013). The Indiana Commission for Higher Education also began to provide high schools with feedback on the success of their graduates in college (Indiana Commission for Higher Education, 2012).

Despite these efforts, the financial costs associated with postsecondary education remain a barrier for many Indiana high school students. Accordingly, the Indiana Commission for Higher Education and the Indiana Department of Education, in collaboration with Indiana's Management Performance Hub, need more information about the different types of financial aid and whether those types of financial aid are associated with students' success during their first two years of college. They asked the Regional Educational Laboratory Midwest (REL Midwest) to use student-level longitudinal data to determine the associations between different types of financial aid and students' success early in college. The findings from this study will help inform policymakers in these agencies and Indiana's legislature as they develop initiatives and legislation to promote college enrollment and completion.

Policymakers in Indiana need information about the association between receipt of financial aid and early college success

In Indiana, the majority of students entering public two- and four-year colleges receive financial aid in the form of institutional, state, or federal grants or loans. Policymakers from the Indiana Commission for Higher Education, the Indiana Department of Education, and the Indiana legislature want to know whether different financial aid types are associated with students' success early in college. These policymakers are especially interested in the associations between federal Pell Grants and Indiana's 21st Century Scholarships (box 1).

Box 1. Pell Grants and 21st Century Scholarship

Pell Grants

Federal Pell Grants help defray the cost of postsecondary undergraduate education for millions of students from low-income households "in an effort to provide truly equal access to higher education" (U.S. Department of Education, 2016, p. 2). Between 2008 and 2014, Pell Grants reduced the cost of postsecondary education by an average of \$3,700 per year for approximately eight million students each year nationwide. Despite efforts to increase postsecondary access, research indicates that recipients of Pell Grants tend to experience less success in college than their peers do. For example, nationally, 51 percent of Pell grant recipients seeking bachelor's degrees graduate within six years compared with 65 percent of nonrecipients (The Education Trust, 2015; U.S. Department of Education, 2017).

21st Century Scholarships

Another type of financial aid that is available to low-income graduates of Indiana high schools is the 21st Century Scholars program (Indiana Commission for Higher Education, 2017). This program is available to students beginning in grade 7 whose family income meets certain income eligibility guidelines (for example, the maximum family income for a family of four is \$45,510). Students must be enrolled in the program by the end of grade 8. In addition, students must meet several ongoing program conditions, including completion of the Scholar Success Program, which includes three key requirements for each grade of high school (for a total of 12 requirements, such as creating a graduation plan in grade 9, estimating the cost of college in grade 10, and filing a Free Application for Federal Student Aid in grade 12); a cumulative high school grade point average (GPA) of 2.5; and graduation with a Core 40 diploma or higher. Scholars who meet all program requirements prior to high school graduation are awarded full tuition costs and some fee costs at Indiana public two- and four-year colleges or a portion of the annual costs at private or select for-profit Indiana colleges. Once enrolled in college, scholars must maintain full course loads and satisfactory academic progress, as defined by their colleges (Indiana Commission for Higher Education, 2017).

College tuition is becoming increasingly more expensive, more than doubling in the last 30 years (NCES, 2015). With an increase in the average cost of tuition, the United States has seen a commensurate growth in the percentage of students who need financial aid (Horn & Paslov,

2014). Each year, federal Pell Grants are awarded to approximately 35 percent to 40 percent of college goers.¹ Altogether, the federal government spends more than \$30 billion annually to help more than eight million students defray the cost of college (The Education Trust, 2015). Even with widespread aid, national statistics indicate that students who receive Pell Grants are, on average, between 14 percentage points and 20 percentage points less likely to complete a degree program than their peers (The Education Trust, 2015).

Indiana students from low-income families also are eligible to receive a 21st Century Scholarship, and, in 2014, 85 percent of all 21st Century Scholars attended public colleges in Indiana. These 21st Century Scholars outperformed their nonscholar, low-income peers on several measures, including enrolling in college directly after high school graduation (77 percent versus 42 percent), taking only nonremedial coursework (79 percent versus 66 percent), persisting to a second year (72 percent versus 66 percent), and completing college within three years for those seeking associate degrees and within six years for those seeking bachelor's degrees (37 percent versus 29 percent). However, these comparisons of 21st Century Scholars with low-income peers who did not receive the scholarship did not control for other student and high school factors (Indiana Commission for Higher Education, 2015).

To better determine whether Pell Grants and 21st Century Scholarships are associated with early college success, REL Midwest designed a study that statistically controlled for other student and school characteristics. The study is similar to that described in another REL Midwest report that was published in 2015 (Stephan et al., 2015) but with two differences. First, the previous study focused on the 2010 cohort of Indiana high school graduates, whereas this study examined the early college success among the 2014 cohort of Indiana high school graduates who first entered college in fall 2014. The later cohort was affected by policy changes involving the process of determining whether students need to take remedial courses.²

Second, the prior study was designed to identify student and school characteristics associated with early college success. Although the current study also looks at characteristics associated with early college success, the main focus is on whether the types of financial aid that students receive are associated with early college success.

¹ The College Board, <https://trends.collegeboard.org/student-aid/figures-tables/undergraduate-enrollment-and-percentage-receiving-pell-grants-over-time>, retrieved December 19, 2017.

² Indiana has shifted most remedial course offerings to Ivy Tech Community College (Indiana's public two-year college system). Ivy Tech now determines whether students need remedial coursework in math based on the Dana Center Mathematics Pathways program, in which students' math performance on the Accuplacer assessment is compared against cutscores that represent the math proficiency required for their programs of study (Charles A. Dana Center, <https://dcmathpathways.org/dcmp>, retrieved January 2, 2018). For subjects other than math, Ivy Tech uses customized placement tests and students' high school GPAs to determine if remedial coursework is required.

This study includes multiple measures of early college success

No single measure of early college success has been universally accepted by both researchers and policymakers.³ Instead, researchers have examined a variety of measures.

Nationally, one third of full-time, degree-seeking students who enter college for the first time will enroll in at least one remedial course, which is defined as “instruction for a student lacking those reading, writing, or mathematics skills necessary to perform college-level work at the level required by the attended institution” (NCES, 2016, table 311). Although such courses can prepare students for more challenging college work, students who enroll in remedial courses tend to be less successful; they earn postsecondary credentials at rates 15 percentage points lower than college students who are not required to enroll in remedial courses (Adelman, 2006; Attewell, Lavin, Domina, & Levey, 2006).

Measures of early college success based on enrollment in remedial courses can be problematic because of institutional differences and changes in remedial education policies. In Indiana specifically, the state enacted remedial education reform in 2010, all but eliminating remedial education from four-year institutions and shifting the vast majority of these courses to Ivy Tech, the state's public two-year college system (Indiana Commission for Higher Education, 2012).

Some prior research considers remediation combined with college achievement as a measure of readiness for succeeding in college. For example, some researchers have defined college readiness as completing credit-bearing general education courses (Conley, 2011), whereas others have defined readiness as having a high probability of succeeding in first-year, credit-bearing college courses (ACT Inc., 2007). Because of its association with college persistence and completion, other researchers have used the successful completion of college coursework, regardless of whether courses are credit bearing or remedial, as an indicator of early college success (Adelman, 2006; Calcagno et al., 2006; McCormick, 1999).

Early college success also is reflected in students' persistence to a second year of college. Students leave college at higher rates (approximately 30 percent overall) in their first year of college than in later years (National Student Clearinghouse, 2015). Although research suggests that a student's persistence may be influenced by several factors unrelated to readiness, including family and financial obligations (Witkow, Huynh, & Fuligni, 2015), students who persist to a second year of college are significantly more likely to still be enrolled or earn a certificate or degree within five years (Horn, 1998). Nationally, full-time students enrolling in

³ Other researchers have referred to these measures as representing students' readiness for college (ACT Inc., 2007; Conley, 2011; Wiley, Wyatt, & Camara, 2010). The term *early college success* was used in this study because it better reflects the time of measurement. The term *college readiness* implies that students' performance on these measures is attributed directly to their level of preparation prior to college, and such attributions may not be justified in all cases.

college for the first time persist at rates of about 60 percent at two-year colleges and about 80 percent at four-year colleges (McFarland et al., 2017).

To better triangulate on the core concept of early college success, the REL Midwest team adopted three separate measures plus a composite of those measures: whether students took only nonremedial coursework in their first semester of college, whether they earned all attempted credits in their first semester of college, and whether they persisted to a second year of college. If students were classified as “yes” on all three measures, they also were classified as “yes” on the composite measure. Otherwise, they were classified as “no” on the composite measure.

What the study examined

This study addressed the following research questions:

- Among the 2014 cohort of Indiana high school graduates enrolling in Indiana public two- or four-year colleges, what percentage of students achieved early college success, and how do those percentages vary by student demographic and academic characteristics; school-level demographic and academic characteristics; and whether students received Pell Grants, 21st Century Scholarships, or other forms of financial aid?
- What is the relationship between receiving aid and early college success, controlling for other student- and school-level characteristics?

REL Midwest’s study team addressed these research questions using de-identified student-level data from the Management Performance Hub’ Education Workforce Development data system. These student-level data were supplemented with publicly available school-level data from the Indiana Department of Education website. High school graduates from 2014 who first enrolled in Indiana public two- or four-year colleges in the fall of 2014 composed the sample (box 2).

The three measures of early college success used in this study—enrolling in only nonremedial courses in the first semester, completing all attempted credits in the first semester, persisting to a second year of college—and their composite align with the academic preparation and college performance indicators used by the Indiana Commission for Higher Education to assess college readiness.⁴ They measure achievement up to and during the early college years to determine whether a student entered a postsecondary institution ready for college.

⁴ Indiana Commission for Higher Education, <http://www.in.gov/che/4553.htm>, retrieved October 3, 2017.

Box 2. Sample, measures, and methodology

Sample

In spring 2014, 71,487 students graduated from 489 public and private Indiana high schools. The full sample for this study consisted of 28,525 (40 percent) of these students who enrolled in one of Indiana's 29 public colleges in fall 2014.^a Of these students, 9,100 entered two-year colleges, and 19,425 entered four-year colleges^b (see appendix A for a description of the sample).

Measures of early college success

This study examined three measures of early college success and a composite of those measures.

Enrollment in only nonremedial courses. In Indiana, remedial courses are seldom offered at four-year colleges (approximately 6 percent of students entering four-year colleges took remedial coursework), and, therefore, this indicator is reported only for students who enter two-year colleges.

Attainment of all attempted credits. Students who did not earn all attempted credits include those who fail first-semester courses (earned less than a D– or failed pass/fail courses), those who withdrew late, and those who received incompletes. This definition does not account for course rigor or the number of attempted credits. It was technically possible to earn all attempted credits while still achieving a GPA that placed the student on academic probation (for example, a GPA of 1.0 or less); however, this crossover was extremely rare. In the current sample, this occurred for approximately 80 of the 28,525 students in the sample. Although there may be other reasons for late withdrawals or incompletes (some unrelated to success), this variable provides a general sense of students' preparation for the courses they chose to attempt.^c

Persistence to a second year. Students in the sample who were still attending Indiana public colleges in fall 2015 also show early college success.

Early college success by all three indicators. This composite measure indicates early college success if a student achieves success according to all three indicators: enrolling in only nonremedial courses in the first semester, earning all attempted credits in the first semester, and persisting to the second year.

Predictors of early college success

The predictor variables include several student- and school-level variables that prior research has consistently shown to be associated with early college success (for example, Stephan et al., 2015).

Demographic and socioeconomic characteristics. Race/ethnicity, gender, English learner status, individualized education program (IEP) status, and eligibility for the free or reduced-price lunch program.

Academic preparation. Students' grade 8 scores for mathematics on the Indiana Statewide Testing for Educational Progress—Plus (ISTEP+),^d their participation in at least one dual-credit course, their performance on AP examinations, and diploma type.

High school attendance. Students were categorized into one of three groups based on the distribution of excused and unexcused absences between school years 2010/11 and 2013/14: less than 14 absences (lower third), 14–28 absences (middle third), or 29 or more absences (upper third).

High school characteristics. The percentage of grade 10 students who passed the English end-of-course assessment in 2014 and the percentage of students who were eligible for the free or reduced-price lunch program.

Financial aid. Whether students received any financial aid (including need-based and merit-based institutional, state, or federal grants or loans), Pell Grants, or 21st Century Scholarships.

Methodology

To address research question 1, the team tabulated the percentages of students who achieved early college success by student and school subgroups, for all students and by institution type (that is, two-year versus four-year colleges).

To address research question 2, the project team conducted a series of stepwise hierarchical general linear models (HGLMs) to estimate the statistical relationship between each financial aid variable and each early college success outcome. These models were run separately for students entering two-year and four-year colleges. Models predicting enrollment in only nonremedial coursework were run only for students entering two-year colleges.

Notes.

- a. Postsecondary data collected by the Indiana Commission for Higher Education are available only for students enrolling in Indiana public colleges.
- b. Approximately 65 percent of all 2014 high school graduates enrolled in some type of postsecondary institution (Indiana Commission for Higher Education, 2016). This figure is slightly lower than the national average of 69 percent (McFarland et al., 2017).
- c. It was technically possible to earn all attempted credits while still achieving a GPA that placed the student on academic probation (for example, a GPA of 1.0 or less); however, this crossover was extremely rare. In the current sample, this occurred for approximately 80 of the 28,525 students in the sample.
- d. Students' scores on the grade 8 ISTEP+ in reading were strongly correlated with their scores in mathematics. Given that correlation, REL Midwest researchers used mathematics scores. Use of ISTEP+ scores in reading instead of mathematics had no impact on study results.

The study analyzed the statistical relationships between student characteristics (such as demographic characteristics, middle school and high school achievement characteristics, and high school attendance), characteristics of students' high schools (such as type of school setting, school-level achievement, and the percentage of students eligible for the free or reduced-price lunch program), students' receipt of different types of financial aid, and the indicators of early college success. Together, these variables may help educators identify students who need intervention to succeed in college. Data on students who first entered two-year colleges were analyzed separately from those of students who first entered four-year colleges.

To address the first research question, the research team tabulated descriptive statistics (the percentages of students demonstrating early college success). The research team addressed the second research question by using the characteristics of students, the characteristics of their high schools, and their financial aid status (and type of aid) as predictors in a series of HGLMs. These models help determine statistical relationships between predictors and outcome variables

(each indicator of postsecondary success) while controlling for the influence of other predictors (additional details on statistical models and methodology can be found in appendix A).

To help readers interpret the results for research question 2, the change in the predicted probability of achieving early college success associated with a unit change in a predictor is presented for an average student in the sample (this process is described in appendix A). The changes in probability are presented separately for students who first enter two-year colleges and those who first enter four-year colleges.

What the study found

Research question 1 asked about the extent to which high school graduates enrolling in Indiana public two- and four-year colleges achieved early college success and whether success varied by financial, demographic, and academic characteristics. Relative to the population of high school graduates enrolling in Indiana public colleges in fall 2014, students who received Pell Grants, males, Black students, students eligible for the free or reduced-price lunch program during high school, and students who had IEPs are overrepresented in two-year colleges and underrepresented in four-year colleges. Specific findings can be found in the following sections.

A larger percentage of students who entered four-year institutions achieved early college success than those who entered two-year institutions

The percentage of Indiana high school graduates enrolling in Indiana public colleges who achieved early college success varied by the indicator of success, the type of institution attended, student and high school characteristics, and the type of financial aid received.

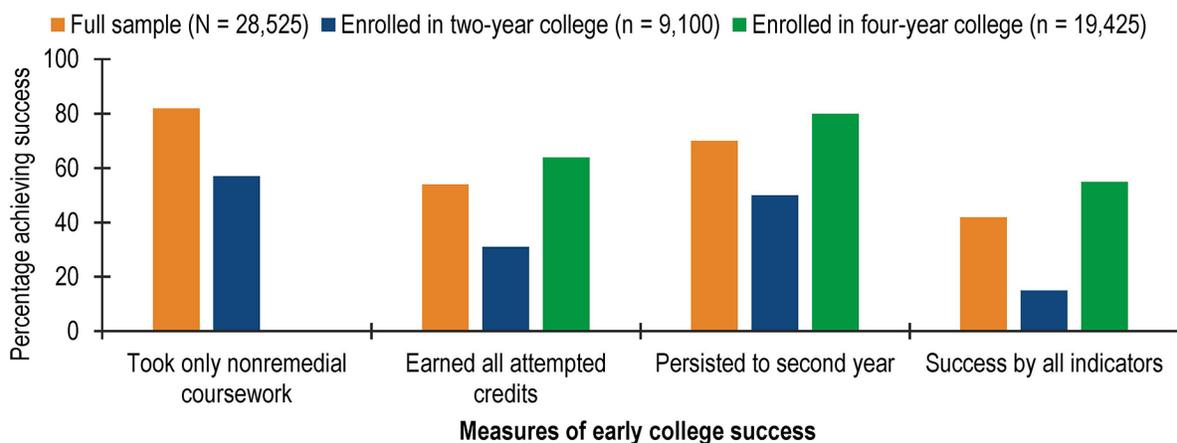
Overall, the majority of all students entering both two- and four-year colleges took only nonremedial coursework (82 percent), earned all attempted credits in their first year (54 percent), and persisted to a second year (70 percent). Taken together, however, only 42 percent were successful by all three indicators. When examining early college success by the type of institution attended, the results show that across all indicators, a larger percentage of students enrolling in four-year colleges achieved early college success versus students enrolling in two-year colleges. For example, 55 percent ($n = 10,693$) of students enrolling in four-year colleges, and 15 percent ($n = 1,354$) of students enrolling in two-year colleges achieved success by all indicators (figure 1).

Early college success also varied by students' demographic characteristics

Early college success varied by students' race/ethnicity, their eligibility for the free or reduced-price lunch program in high school, their academic experiences in high school, and school

characteristics. Select results are presented in the following subsections (with more detailed results in appendix B).

Figure 1. The percentage of 2014 high school graduates who entered college in fall 2014 and achieved early college success varied by the type of institution



Note: For the "took only nonremedial coursework" category, the full sample incorporated all students from the sample, including those entering four-year colleges. In Indiana, remedial courses are seldom offered at four-year colleges (approximately 6 percent of students entering four-year colleges took remedial coursework), and, therefore, this indicator is reported only for students who enter two-year colleges.

Source: Authors' analyses.

Race/ethnicity. Among students entering two-year colleges, there were double-digit gaps between the percentages of Black and White students who achieved early college success (see table B1 in appendix B). Specifically, Black students showed lower rates of success compared with White students relative to nonremedial coursework (35 percent versus 63 percent, respectively), earning all attempted credits (17 percent versus 35 percent, respectively), persisting to a second year (37 percent versus 53 percent, respectively), and achieving success by all indicators (4 percent versus 18 percent, respectively). Larger percentages of White students achieved early college success compared with Hispanic students, but these differences were not as pronounced as the differences involving Black students. These gaps by race/ethnicity were smaller among students entering four-year colleges (table B2 in appendix B).

Eligibility for the free or reduced-price lunch program. Students who were eligible for the free or reduced-price lunch program in high school lagged behind those not eligible on all indicators of success. For students who were eligible for the free or reduced-price lunch program in high school and entered a two-year college, 49 percent took only nonremedial courses (compared with 64 percent of those who were not eligible for the program); 24 percent earned all attempted credits (compared with 37 percent); 43 percent persisted to a second year (compared with 56 percent); and 10 percent showed success on all three indicators (compared with 19 percent; see table B1 in appendix B). Among students entering four-year colleges, 51 percent of those

eligible for the free or reduced-price lunch program earned all attempted credits (compared with 68 percent of students not eligible for the program); 70 percent persisted to a second year (compared with 83 percent); and 41 percent achieved success by all indicators (compared with 60 percent; see table B2 in appendix B).

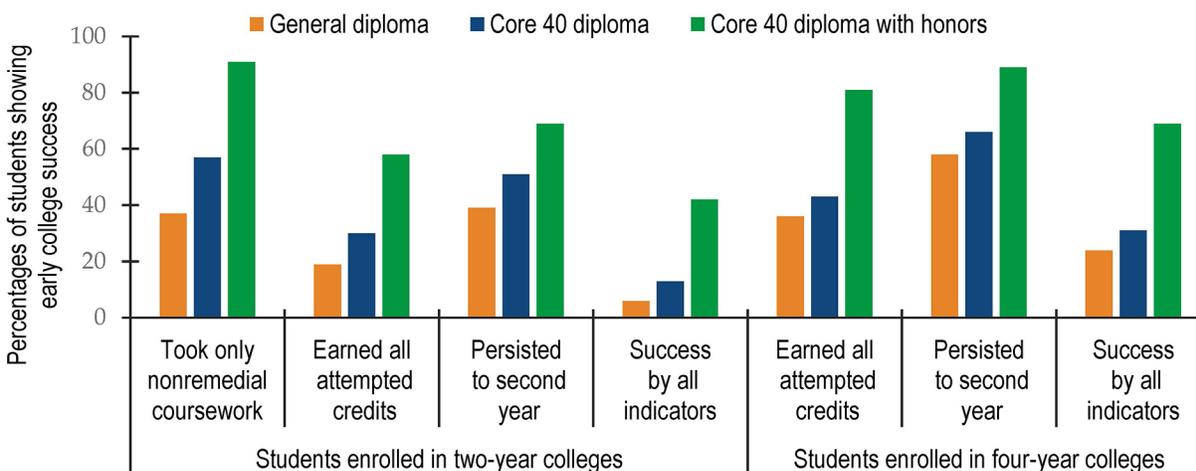
Early college success also varied by students' academic characteristics

For students entering both two- and four-year colleges, the percentage of students achieving early college success varied by the type of diploma earned, whether students participated in and completed dual-credit and AP coursework, and by students' grade 8 ISTEP+ mathematics test scores. The following subsections summarize the relationships between diploma type, students' participation in AP coursework, and early college success (tables B1 and B2 in appendix B).

Type of diploma earned. There were double-digit differences in the percentages of students entering two-year colleges who achieved early college success between students who earned Core 40 diplomas with honors and those who earned Core 40 diplomas (figure 2; see table B1 in appendix B). Those who earned the Core 40 diploma with honors were more likely than those with the Core 40 diploma without honors to take only nonremedial coursework (91 percent versus 57 percent, respectively), earn all attempted credits (58 percent versus 30 percent, respectively), persist to a second year (68 percent versus 51 percent, respectively), and achieve success by all indicators (42 percent versus 13 percent, respectively).

A similar pattern was apparent among those graduates who entered four-year colleges. Less than 1 percent of these students earned general diplomas, whereas 37 percent earned Core 40 diplomas and 62 percent earned Core 40 diplomas with honors (see table B2 in appendix B). The findings show double-digit differences in the percentages of students achieving early college success between students who earned Core 40 diplomas with honors versus those who earned Core 40 diplomas. A greater percentage of those with Core 40 diplomas with honors earned all attempted credits (77 percent versus 43 percent for Core 40), persisted to a second year of college (89 percent versus 66 percent for Core 40), and achieved success by all indicators (69 percent versus 31 percent for Core 40; see figure 2).

Figure 2. Students who graduated from Indiana high schools in 2014 with Core 40 diplomas with honors achieved greater early college success



Source: Authors' analyses.

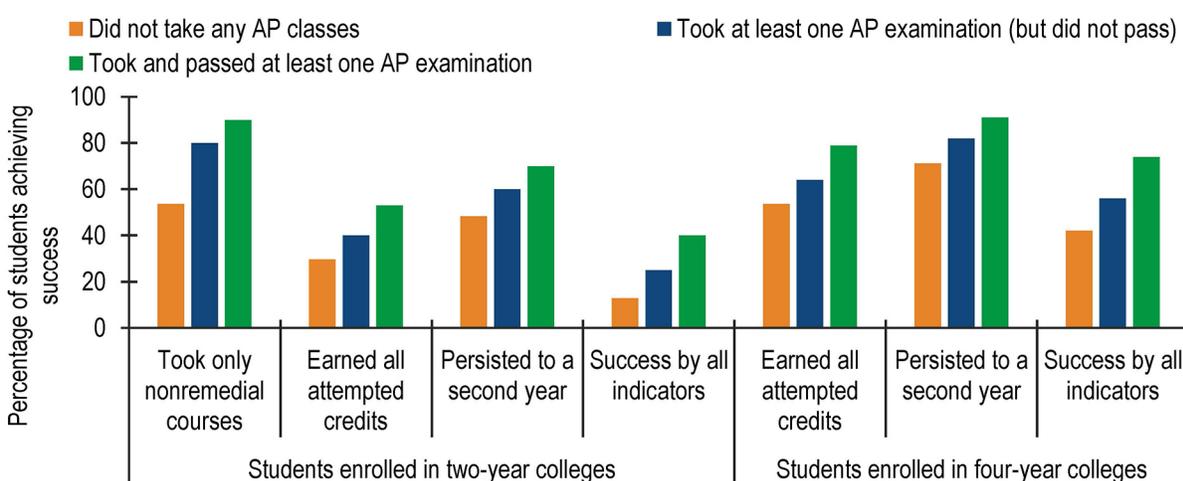
Taking Advanced Placement examinations. Students who take AP courses must pass the course-specific AP examination to be eligible to earn college credit.⁵ A greater proportion of students entering four-year colleges took AP examinations than did those entering two-year colleges. Approximately 13 percent of students entering two-year colleges took at least one AP examination during high school; of those students, 23 percent passed at least one AP examination. For students entering four-year colleges, 56 percent took at least one AP examination during high school; of those students, 52 percent passed at least one examination.

Students who took at least one AP examination were more likely to achieve early success in college, regardless of whether they passed the examination or the type of college in which they enrolled. Among students who enrolled in two-year colleges, 54 percent of those who did not take any AP examinations took only nonremedial coursework (versus 80 percent for those who took but did not pass at least one AP examination and 90 percent for those who took and passed at least one examination). Similar patterns were demonstrated for earning all attempted credits (30 percent for those who did not take any AP examinations versus 40 percent for those who took at least one but did not pass any versus 53 percent for those who took and passed at least

⁵ AP examinations are scored on a 1–5 scale. Higher education institutions set their own standards for what is accepted for college credit (College Board, <https://apscore.collegeboard.org/scores/about-ap-scores/>, retrieved January 2, 2018). For the purposes of this analysis, the variable “Took and passed at least one AP examination” refers to students who scored 3 or higher on at least one examination, and the variable “Took at least one AP examination but did not pass any” refers to students who scored below 3 on all AP examinations they took. This terminology is consistent with how the Indiana Department of Education operationalizes and reports on AP performance in the state (Eltz, 2016) and also is consistent with terminology used in the 2015 REL Midwest report on the early college success of the 2010 cohort of Indiana high school graduates (Stephan et al., 2015).

one examination), persisting to a second year of college (48 percent versus 60 percent and 70 percent, respectively), and achieving success by all indicators (13 percent versus 25 percent and 40 percent, respectively). Although a greater percentage of students who enrolled in four-year colleges achieved early college success in general, the same pattern was evident: students who took at least one AP examination in high school but did not pass the examination(s) achieved success at greater rates than did students who did not take any AP examinations, and those who took and passed at least one AP examination achieved even higher rates of success (figure 3; see tables B1 and B2 in appendix B).

Figure 3. Percentage of students entering two- and four-year colleges achieving early college success by whether they took and passed AP examinations, fall 2014/15



Source: Authors' analyses.

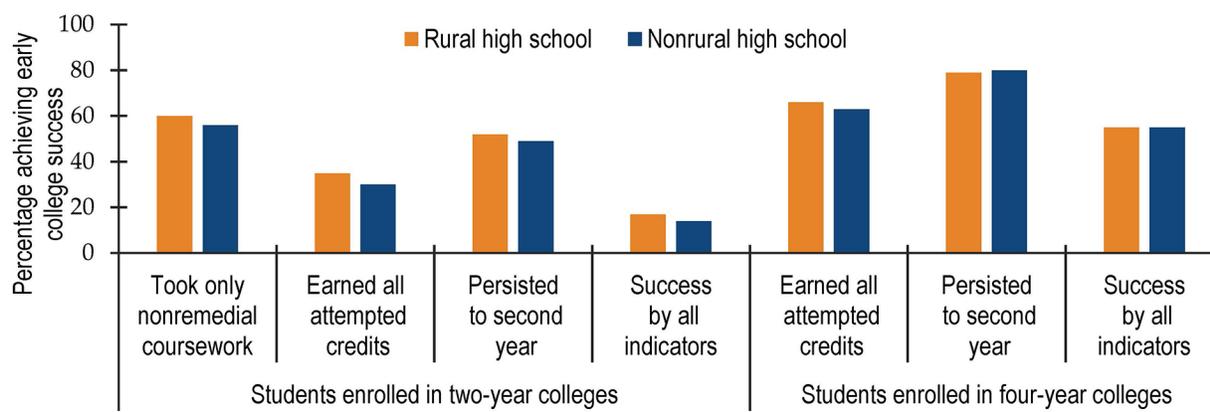
Students' early college success varied by the characteristics of their high schools

Rates of early college success also varied by school-level demographic and academic characteristics and by high school locale.

Percentage of students eligible for the free or reduced-price lunch program. Students who attended high schools with lower percentages of students eligible for the free or reduced-price lunch program showed higher rates of early college success. This relationship was present among students entering both two- and four-year colleges. Among high school graduates who attended four-year colleges, for example, 69 percent of those graduating from schools with low percentages of eligibility for the free or reduced-price lunch program earned all attempted credits compared with 64 percent of students from schools in the middle of the eligibility distribution and 54 percent who attended high schools with high percentages of students eligible for the program (tables B1 and B2 in appendix B).

High school locale. Approximately 24 percent of the 2014 cohort graduated from a rural high school. Among students entering two-year colleges, a slightly larger percentage of students who graduated from rural high schools achieved early college success compared with those who graduated from nonrural high schools. The data show very little difference in early college success between rural and nonrural high school graduates who enrolled in four-year colleges (figure 4; see tables B1 and B2 in appendix B).

Figure 4. Students who graduated from rural high schools in 2014 and entered two-year colleges achieved early college success at a slightly higher rate than graduates of nonrural high schools, but little rural/nonrural difference in early college success was found for those entering four-year colleges



Source: Authors' analysis.

Early college success varied by the types of financial aid that students received

For research question 2, project analysts examined the likelihood of achieving early college success for recipients of financial aid of any kind, Pell Grants, and 21st Century Scholarships while controlling for other student- and school-level characteristics. The final models focused on four categories of aid: did not receive aid (comparison category), received aid other than Pell Grants and 21st Century Scholarships, received Pell Grants only, and received 21st Century Scholarships only. The results of the final analytic model are presented first for students entering two-year colleges and then for students entering four-year colleges (figure 5). The findings for different types of financial aid are presented as odds ratios⁶ (OR; see appendix A and tables B3, B4 and B5 in appendix B for odds ratios for all models and predictors).

⁶ Odds ratios provide an estimate of how predictors are related to the odds that a student shows early college success according to a particular measure. Values greater than 1 indicate that being in the affirmative category (for example, receiving financial aid) are associated with higher odds of displaying the indicator of early college success. Values less than 1 indicate that being in the affirmative category are associated with lower odds of displaying the indicator of early college success.

Students enrolling in two-year colleges

The association between receiving financial aid and early college success depends on the types of financial aid students received. Those receiving 21st Century Scholarships showed greater early college success, whereas those receiving Pell Grants showed less early college success.

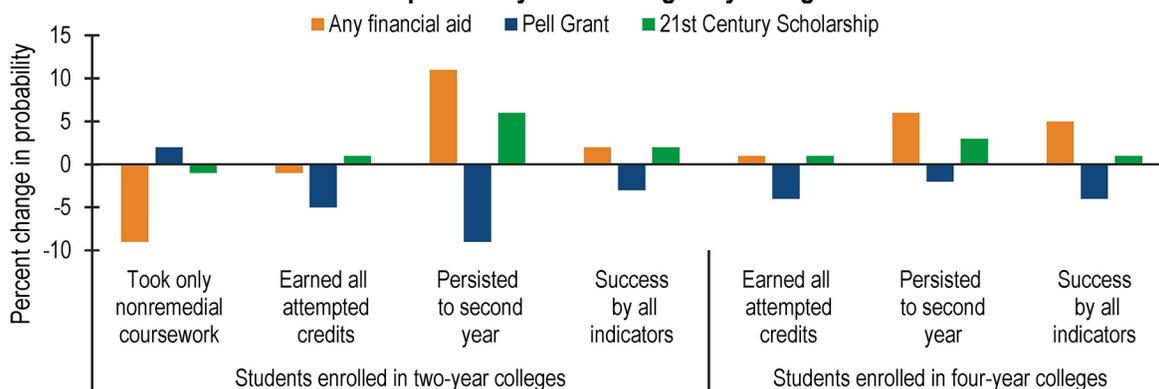
Receiving Pell Grants. Students enrolled in two-year colleges who received Pell Grants were significantly less likely than those who did not receive Pell Grants to earn all attempted credits in the first year (OR = 0.79, $p = 0.001$), persist to a second year (OR = 0.70, $p < 0.001$), and achieve success by all indicators (OR = 0.72, $p < 0.001$) after controlling for other characteristics, including whether students received any aid or received 21st Century Scholarships. After controlling for other variables, receiving a Pell Grant was associated with a 5 percentage point decrease in the likelihood of earning all attempted credits in the first year; a 9 percentage point decrease in the likelihood of persisting to a second year; and a 3 percentage point decrease in the likelihood of achieving success by all indicators. Receiving a Pell Grant was not significantly associated with the likelihood of taking only nonremedial coursework (see figure 5).

Receiving 21st Century Scholarships. Students enrolled in two-year colleges who received 21st Century Scholarships were significantly more likely than those who did not receive these scholarships to persist to a second year (OR = 1.25, $p < 0.001$). After controlling for other variables, receiving a 21st Century Scholarship was associated with a 6 percentage point increase in the likelihood of persisting to a second year. Receiving a 21st Century Scholarship was not significantly associated with the likelihood of taking only nonremedial coursework, earning all attempted credits, or achieving success by all indicators.

Receiving other financial aid.⁷ Students enrolled in two-year colleges who received other types of financial aid were significantly less likely than those who did not receive aid to take only nonremedial coursework in the first semester of college (OR = 0.67, $p < 0.001$). Those same students were significantly more likely than those who did not receive aid to persist to a second year of college (OR = 1.55, $p < 0.001$). Both findings were true after controlling for other student- and school-level characteristics, including whether a student received a Pell Grant or a 21st Century Scholarship. After controlling for these other variables, receiving financial aid was associated with a 9 percentage point decrease in the likelihood of taking only nonremedial coursework and an 11 percentage point increase in the likelihood of persisting to a second year (figure 5). Receiving any financial aid was not significantly associated with the likelihood of earning all attempted credits or achieving success by all indicators.

⁷ This category of aid represents students who generally were not from low-income households and not eligible for Pell Grants or the federal free or reduced-price lunch program but were eligible for some financial aid, including Parent PLUS loans, and academic and athletic scholarships.

Figure 5. The types of financial aid that 2014 high school graduates received as they entered college in fall 2014 were related to differences in the probability of achieving early college success



Note: The change in probability is compared with the average student in the average school who did not receive any aid, did not receive a Pell Grant, or did not receive a 21st Century Scholarship.

Source: Authors' calculations.

Students enrolling in four-year colleges

The associations between receiving financial aid and early college success for enrollees in four-year institutions were much the same as for enrollees in two-year institutions. The association between obtaining financial aid and early college success depended on the type of aid received. Those receiving 21st Century Scholarships showed more early college success, whereas those receiving Pell Grants showed less early college success.

Receiving Pell Grants. Pell grant recipients who enrolled in four-year colleges were significantly less likely than nonrecipients to earn all attempted credits in the first year (OR = 0.83, $p = 0.001$), significantly less likely to persist to a second year (OR = 0.87, $p = 0.007$), and significantly less likely to meet all three early college success indicators (OR = 0.87, $p = 0.001$) after controlling for other characteristics,⁸ including whether students received 21st Century Scholarships. Controlling for other variables, receiving a Pell Grant was associated with a 4 percentage point decrease in the likelihood of earning all attempted credits in the first year, a 2 percentage point decrease in the likelihood of persisting to a second year, and a 4 percentage point decrease in the likelihood of meeting all three early college success indicators.

Receiving 21st Century Scholarships. Students enrolled in four-year colleges who received 21st Century Scholarships were significantly more likely than those who did not receive 21st Century Scholarships to persist to a second year (OR = 1.26, $p < 0.001$). Controlling for other variables, receiving a 21st Century Scholarship was associated with a 3 percentage point

⁸ This analysis controlled for whether students were eligible for the federal free or reduced-price lunch program. Although this variable and Pell Grant status measure poverty, these variables were not highly correlated, suggesting that eligibility for the free or reduced-price lunch program may not accurately represent low-income status. However, sensitivity analyses show no notable differences when the variable was removed from the regression models.

increase in the likelihood of persisting to a second year. However, scholarship receipt was not significantly associated with earning all attempted credits or achieving success by all indicators.

Receiving other financial aid. Students enrolled in four-year colleges who received other types of financial aid were significantly more likely than those who did not receive financial aid to persist to a second year (OR = 1.46, $p < 0.001$). Those same students were significantly more likely to achieve early college success by all indicators (OR = 1.22, $p < 0.001$). Both findings were true after controlling for other student- and school-level characteristics, including whether a student received a Pell Grant or a 21st Century Scholarship. Controlling for these other variables, receiving financial aid was associated with a 6 percentage point increase in the likelihood of persisting to a second year and a 5 percentage point increase in the likelihood of achieving success by all indicators. Receiving any financial aid was not significantly associated with the likelihood of earning all attempted credits.

Implications

The results of this study raise several considerations for improving early college success among students enrolling in Indiana public colleges. While the findings may not generalize to other states, policymakers or practitioners in other states may want to conduct similar studies in their states to determine if the statistical relationships in their jurisdiction are similar to those in Indiana.

Students from disadvantaged backgrounds and those entering two-year colleges have a lower rate of early college success than their peers

There were double-digit gaps between Black and White students (differences between 14 percentage points and 28 percentage points) and between students eligible and not eligible for the free or reduced-price lunch program (differences between 9 percentage points and 19 percentage points) on most indicators of early college success for students entering both two- and four-year colleges. In addition, considerable overlap occurred between these two subgroups. Although Black students composed only 10 percent of the overall sample, they represented 22 percent of those eligible for the free or reduced-price lunch program. Further, students who participated in AP and dual-enrollment coursework achieved early college success at a higher rate than their peers did, but the overlap between these subgroups was much less substantial. For example, Black students represented only 6 percent of the students taking AP coursework and 6 percent of those participating in dual-enrollment coursework. Further, students entering two-year colleges achieved early college success at a lower rate than those entering four-year colleges (differences between 30 percentage points and 40 percentage points). These findings are consistent with the 2015 REL Midwest report that examined early college success for the 2010 cohort of Indiana high school graduates enrolling in Indiana public colleges (Stephan et al., 2015). Indiana high schools, public colleges, and state agencies may

want to consider providing additional resources toward counseling programs and other college readiness supports to members of disadvantaged groups and their families.

In addition, students in high schools with larger percentages of students eligible for the free or reduced-price lunch program were less likely to have achieved early college success than those in high schools with lower percentages of program-eligible students. Future research examining differences in academic and college and career readiness resources offered at schools with high versus low percentages of students eligible for the free or reduced-price lunch program, as well as to what extent students from different racial/ethnic and socioeconomic backgrounds are participating in or taking advantage of these resources within the same schools, may help state practitioners and policymakers understand these differences in early college success outcomes.

The percentage of students taking remedial coursework at two-year colleges has substantially decreased

REL Midwest's 2015 report showed that just 33 percent of the 2010 cohort of high school graduates entering two-year colleges enrolled in only nonremedial coursework (Stephan, et al., 2015). In the current analysis of the 2014 cohort, this figure has nearly doubled to 57 percent. This change in the percentage of students achieving early college success as measured by taking only nonremedial coursework was not met with commensurate increases in students completing all attempted credits in the first semester or persistence to the second year. In the 2010 cohort, 48 percent of the students entering two-year colleges earned all attempted credits, and 58 percent persisted to a second year. Among students entering two-year colleges in 2014, these percentages were much lower (31 percent earned all attempted credits, and 50 percent persisted to a second year). This increase in taking only nonremedial coursework among two-year college students may be more reflective of statewide initiatives and policy changes than of improved college readiness among those students. For example, beginning in fall 2014 (the year the current sample entered Indiana public colleges), Ivy Tech implemented differential pathways for remediation through the Dana Center Mathematics Pathways program, in which students' mathematics performance on the Accuplacer assessment is compared against cutscores that represent the math proficiency required for their programs of study. Prior to this policy change, all incoming students' scores were compared against the cutscores for college algebra, which is intended for STEM majors.⁹

⁹ Charles A. Dana Center, <https://dcmathpathways.org/dcmp>, retrieved January 2, 2018.

Pell Grant recipients who did not also receive 21st Century Scholarships were less likely to achieve success

Receiving a Pell Grant is a proxy for low-income status among students enrolling in colleges because the only eligibility criterion for receiving a Pell Grant is income. Because income is a strong and consistent predictor of academic success at all levels of the educational pipeline, including postsecondary success (for example, McFarland et al., 2017; Ross et al., 2012), it is not surprising that the recipients of Pell Grants are less likely to achieve early college success than their peers, even after controlling for other characteristics. Future, more rigorous research on this topic should investigate the possibility of causal relationships between receiving a Pell Grant and early college success. Further, several factors should be considered that may help increase early college success among Pell Grant recipients, including encouraging high school students from low-income households to participate in the 21st Century Scholars program, and increasing assistance and support for Pell Grant recipients at the colleges in which they enroll.

Based on the results of the current study, middle and high schools in Indiana may want to bolster promotion of the 21st Century Scholars program. Other states that sponsor college and career readiness programs for students from low-income households also may benefit from this consideration. While there is not yet evidence that participation in the 21st Century Scholars program causes an increase in early college success, the results from the current study suggest that students who receive 21st Century Scholarships may achieve greater early college success on most measures of early college success compared with students who receive Pell Grants but not 21st Century Scholarships. Students who participate in the 21st Century Scholars program receive college readiness supports throughout middle and high school, including participating in such college readiness activities as creating graduation plans, taking career interest assessments, and learning about how to pay for college. In addition, recipients of 21st Century Scholarships receive support resources once they enroll in college.¹⁰ Encouraging students to participate in this program may be one way to help narrow the early college success gap between Pell Grant recipients and nonrecipients.

For students who do not receive 21st Century Scholarships, institutions in which Pell Grant recipients enroll may consider taking a closer look at the gap between Pell Grant recipients and nonrecipients and take targeted steps toward increasing assistance and support to bolster recipients' success in college. In a recent report, The Education Trust described several steps that some colleges have taken to close the success and attainment gap between Pell Grant recipients and nonrecipients, including promoting cultures of inclusion and belonging; targeted, mandatory student advising; and investigating, understanding, and mitigating the barriers to success experienced by students

¹⁰ Indiana Commission for Higher Education, <http://scholars.in.gov/>, retrieved July 14, 2017.

from low-income and other disadvantaged backgrounds. (See The Education Trust, 2015, for several case studies of colleges' efforts to increase success among Pell Grant recipients.)

Limitations

This study has five limitations. First, only college enrollments for Indiana public colleges were included in these analyses. Although this limits the generalizability of the findings, 40 percent of the 2014 cohort of college-going high school graduates enrolled in Indiana public colleges (Indiana Commission for Higher Education, 2016). This is the student subgroup of most interest to the Indiana Commission for Higher Education and the Indiana Department of Education (the requestors of this study).

Second, the early college success measure of persisting to a second year does not account for students who may have transferred out of Indiana's public college system to attend either private in-state colleges or out-of-state public or private colleges. Consequently, counts of students persisting to a second year of college may be lower than is actually the case. However, prior analysis using data from the National Student Clearinghouse to identify students who transfer out of Indiana public colleges suggest that the number of students affected is likely to be minimal (Burke, Davis, & Stephan, 2015; Stephan et al., 2015).

Third, this analysis includes only graduates in the analytic sample who continued on to Indiana public colleges in the fall immediately after graduation from high school. Thus, the results cannot be generalized to incorporate students who may have either enrolled in private or out-of-state colleges or delayed their enrollment. The results also cannot be generalized to all students who attend these colleges.

Fourth, early college success depends on many factors, such as those related to personal readiness, cognitive strategies, college knowledge, academic behaviors, and lifelong learning (Conley, 2010; Lippman, Atienza, Rivers, & Keith, 2008); however, the state data do not capture measures of all these factors. Although this study has identified multiple predictors of early college success, additional measures such as Accuplacer scores and noncognitive factors such as goal striving and motivation could explain variation in the indicators studied and may be more important for some indicators (such as enrolling in only nonremedial courses). Only future research can determine the validity and relevance of such indicators.

Finally, this study is correlational and cannot detect causal relationships. It does, however, provide information about Indiana students that policymakers and practitioners can use to understand what differences in early college success exist among various groups of students and how differences may relate to the receipt of various types of financial aid. Such information

can be useful in Indiana and other states to help inform policymakers' decisions involving policies, programs, and initiatives to support college and career success.

Appendix A. Methodology

This study addressed questions posed by the Indiana Commission for Higher Education and the Indiana Department of Education. This appendix provides further detail on the study's sample, missing data, measures, and analysis methods.

Data sources

Data for the current study came from two sources. Student- and college-level characteristics were obtained from the Education Workforce Development database of the Management Performance Hub. This database is a clearinghouse that links agency-collected data from four state agencies: the Indiana Commission for Higher Education, the Indiana Department of Education, the Department of Workforce Development, and the Family and Social Services Administration. The data shared by the Management Performance Hub for this study came from two agencies: The Indiana Department of Education and the Indiana Commission for Higher Education.

At multiple times throughout the calendar year, public school districts (referred to in Indiana as *school corporations*) and private schools in Indiana are required to provide timely and accurate student-level information to the Indiana Department of Education. The department provides districts and private schools with detailed data collection tables that include definitions and codes for various data elements, due dates for submitting data to the Department, and contact information for Department staff who can help answer questions about the various data elements. Student-level demographic information and information on students' experiences while in grades K–12 (listed later in this appendix) come from the data files provided to the Performance Management Hub by Indiana's Department of Education.

High school-level characteristics of the percentage of students eligible for the free or reduced-price lunch program and the percentage of students in grade 10 who passed the English end-of-course examination came from publicly available data files on the Indiana Department of Education website.

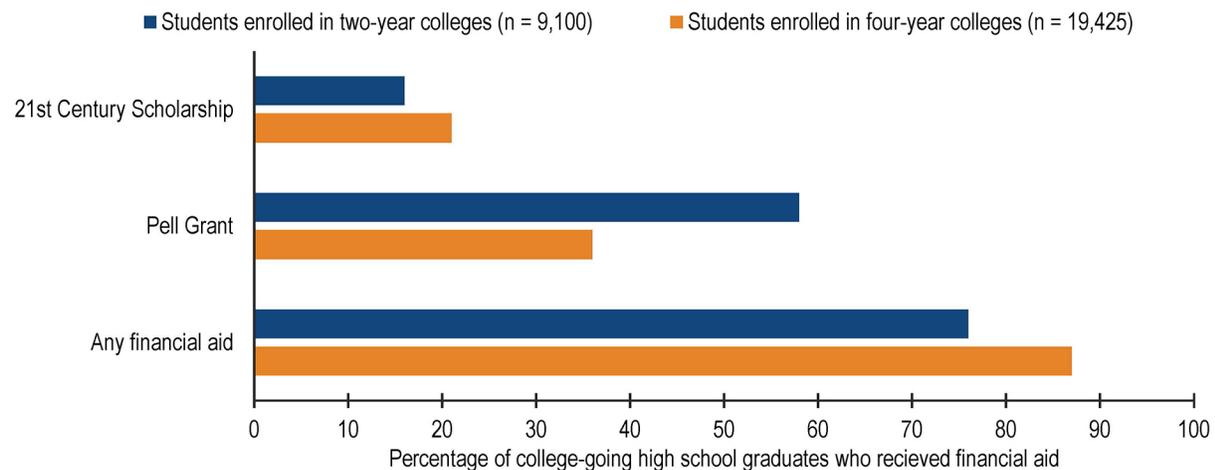
Data elements that reflect high school graduates' experiences in college come from the Indiana Commission for Higher Education. The commission collects some data directly from the 29 public colleges and universities, and other data elements come to the commission indirectly, through the National Student Clearinghouse. For data collected by the commission and National Student Clearinghouse, institutions receive clear data layout tables that define the data elements needed, provide due dates for datasets, and provide contact information of individuals who can answer questions. The collection of these data are facilitated by staff

employed by the colleges and universities within their institutional research offices and by staff who are employed by the Indiana Commission for Higher Education but work within the administrative offices of Indiana's public colleges and universities. At the time that the Management Performance Hub fulfilled REL Midwest's data request for this study, the commission did not have National Student Clearinghouse data on Indiana high school graduates from 2014 who attended a postsecondary institution in another state.

Sample

The full sample consisted of 28,525 students who graduated from one of 489 public or private high schools in Indiana in spring 2014 and attended one of Indiana's 29 public colleges in fall 2014. These students were primarily White (79 percent), with smaller percentages of students who were Black (10 percent), Hispanic (6 percent), or another race (Asian/Pacific Islanders, American Indian/Alaska Native, or more than one race [5 percent]). Fifty-six percent of the students were female, and 30 percent were eligible for the free or reduced-price lunch program (a proxy for low-income status). Forty-six percent of the students in the full sample earned Core 40 diplomas with honors (see table A1 for a breakout of Indiana's high school graduation requirements and diploma types). Of these students, 9,100 entered two-year colleges, and 19,425 entered four-year colleges in fall 2014. Eighty-four percent of the sample received financial aid. Of these students, 54 percent received Pell Grants, and 23 percent received 21st Century Scholarships. Eighty-six percent of 21st Century Scholarship recipients also received Pell Grants. Fifty-eight percent of the students entering two-year colleges and 39 percent of students entering four-year colleges received Pell Grants. Sixteen percent of two-year and 21 percent of four-year college goers received 21st Century Scholarships (figure A1).

Figure A1. Most Indiana students who attended public colleges in Indiana received financial aid, fall 2014/15



Source: Authors' analysis.

The sample does not include students who graduated in spring 2014 and delayed college enrollment or students who transferred to Indiana public colleges in fall 2014. See table A1 for the characteristics of the overall sample, students entering two-year colleges, and students entering four-year colleges.

Missing data

The rate of missing data was very low. Where data were missing, the research team used different methods of imputation for the hierarchical general linear model (HGLM) analyses. For students' ISTEP+ mathematics scores and cumulative high school absences, we replaced missing values with the grand mean of the sample. For the school-level percentages of students eligible for the free or reduced-price lunch program and the percentage of students in grade 10 who passed the English end-of-course examination, we aggregated the available student-level measures of the respective variables. HGLMs do not allow for missing data at the Level 2 unit of analysis. After imputation, there remained 63 students in seven high schools in the four-year sample; six students in four high schools in the two-year sample were excluded from the HGLM analyses because of missing data at the school level (see table A2).

Table A1. Student and high school characteristics of the full sample, students entering two-year colleges, and students entering four-year colleges, fall 2014

Characteristic	Full sample (N = 28,525)		Students entering two-year colleges (N = 9,100)		Students entering four-year colleges (N = 19,425)	
	Number	Percentage	Number	Percentage	Number	Percentage
Early college outcome variables						
Completed only nonremedial coursework	23,377	82	5,224	57	18,153	94
Earned all attempted credits	15,313	54	2,857	31	12,456	64
Persisted to a second year of college	20,106	71	4,564	50	15,542	80
Success by all indicators	12,047	42	1,354	15	10,693	55
Financial aid variables						
Student received any type of financial aid	23,802	83	6,876	76	16,926	87
Student received Pell Grant	12,785	45	5,258	58	7,527	39
Student received 21st Century Scholarship	5,462	19	1,489	16	3,973	21
Student characteristics						
Gender						
Male	12,686	45	4,338	48	8,348	43
Female	15,839	56	4,762	52	11,077	57
Race/ethnicity						
White	22,601	79	6,613	73	15,988	82
Black	2,834	10	1,375	15	1,459	8
Hispanic	1,577	6	641	7	936	5
Other ^a	1,513	5	471	5	1,042	5
Eligibility for the free or reduced-price lunch program						
Not eligible	19,571	69	5,004	55	14,567	75
Eligible	8,633	30	3,933	43	4,700	24
Unknown	321	1	163	2	158	1
English learner status						
Not English learner student	26,762	94	8,379	92	18,383	95
English learner student	1,511	5	590	7	921	5
Unknown	252	1	131	1	121	1
Individualized education program (IEP) status						
Ever had IEP	1,770	6	1,222	13	548	3
High school diploma type						
General	1,628	6	1,561	17	67	0
Core 40	13,261	47	6,174	68	7,087	37
Core 40 with honors	13,077	46	1,050	12	12,027	62
Other ^b	559	2	315	4	244	1

Characteristic	Full sample (N = 28,525)		Students entering two-year colleges (N = 9,100)		Students entering four-year colleges (N = 19,425)	
	Number	Percentage	Number	Percentage	Number	Percentage
Dual-credit coursework						
Participated in dual-credit coursework	17,425	61	3,908	43	13,517	70
Earned at least one dual credit	17,238	60	3,809	42	13,429	69
Advanced Placement (AP)						
Took at least one AP examination but did not pass any	6,120	22	908	10	5,212	27
Took and passed at least one AP examination	6,015	21	268	3	5,747	30
Grade 8 ISTEP+ mathematics score						
340–580	9,148	34	5,098	60	4,050	22
581–628	8,978	33	2,469	29	6,509	35
629–830	8,884	33	937	11	7,947	43
Total high school absences						
13 days or less	9,900	35	2,351	26	7,549	39
13–27 days	9,144	32	2,701	30	6,443	33
More than 27 days	9,461	33	4,043	45	5,418	28
High school characteristics						
High school locale						
Nonrural	19,908	70	6,052	67	13,856	71
Rural	6,875	24	2,624	29	4,251	22
Unknown	1,742	6	424	5	1,318	7
Percentage of students eligible for the free or reduced-price lunch program						
Less than 30 percent	7,872	34	1,808	23	6,064	39
30–48 percent	8,067	34	2,941	38	5,126	33
More than 48 percent	7,505	32	3,061	39	4,444	28
Percentage of students in grade 10 who passed the English end-of-course examination						
Less than 78 percent	8,495	34	3,424	43	5,071	30
78–86 percent	8,372	34	2,777	35	5,595	33
More than 86 percent	8,107	33	1,780	22	6,327	37

iSTEP+ is Indiana Statewide Testing for Educational Progress—Plus.

a. The “other” race category includes students who are identified as Asian (1.8), Pacific Islander (>1), American Indian/Alaska Native (>1), and two or more races (3).

b. The “other” high school diploma type includes students who earned diplomas in alternative environments, such as students who participated in a General Education Development program.

Source: Authors' analyses.

Table A2. Number and percentage of missing cases for all variables in the analysis

Variable	Number of valid cases	Percentage missing
Student-level variables		
<i>Demographic variables</i>		
Gender	28,525	0.0
Race/ethnicity	28,525	0.0
Eligible for free or reduced-price lunch program	28,525	0.0
English learner status	28,525	0.0
Ever had an IEP	28,525	0.0
<i>High school achievement-related variables</i>		
Diploma type	28,525	0.0
Participated in dual credit	28,525	0.0
Earned at least one dual credit	28,525	0.0
Took at least one AP examination but did not pass any	28,525	0.0
Took and passed at least one AP examination	28,525	0.0
Grade 8 ISTEP+ mathematics score	27,010	5.3
Total high school absences	28,505	0.1
<i>Student aid variables</i>		
Overall aid status	28,525	0.0
Pell Grant status	28,525	0.0
21st Century Scholarship status	28,525	0.0
High school level variables		
Student graduated from a rural high school	28,525	0.0
Percentage of students eligible for the free or reduced-price lunch program	28,460	< 1.0
Percentage of students in grade 10 who passed the English end-of-course examination	28,521	< 1.0
College-level variables		
Institution type	28,525	0.0
Indicators of early college success		
Took only nonremedial coursework	28,525	0.0
Earned all attempted credits	28,525	0.0
Persisted to a second year of college	28,525	0.0
Success by all indicators	28,525	0.0

Source: Authors' analyses.

Measures

The outcome measures for the analyses included three indicators of early college success, and a composite of the three measures. The predictor variables included several student- and school-level variables at the middle and high school levels that prior research has consistently shown to be associated with early college success (e.g., Stephan et al., 2015). Student financial aid variables also were added to the models in a stepwise manner.

Defining early college success

No widely accepted measure exists of whether a student is succeeding in college. Because each indicator has limitations, this study included three measures of early college success as well as a composite of those measures.

Whether students enrolled in only nonremedial courses. One indication of early college success occurs when a student is not required to enroll in a remedial course (mathematics or English) in the first semester of college (fall 2014 for this study). Students who enroll in a remedial college course are seen as lacking the knowledge or skills needed to complete entry-level college courses. Research has shown that students who must take remedial courses are less likely to complete a college degree (Bettinger & Long, 2009; Levin & Calcagno, 2008). In Indiana, high schools are required to identify students who may be heading for remediation after high school.¹¹ For Indiana students, remedial courses are seldom offered at four-year colleges (approximately 6 percent of the current sample), and, therefore, this indicator is reported only among students who enter two-year colleges.

Whether students earned all attempted credits. Another indication of early college success is if a student earned all attempted credits in the first semester of college (fall 2014). Students who did not earn all attempted credits included those who failed courses (earned less than a D– or failed pass/fail courses), those who withdrew late, and those who received incompletes. This definition does not account for course rigor or the number of attempted credits.¹² Although other reasons unrelated to preparation may explain why students withdraw late or receive incompletes, this variable attempts to indicate a general measure of early college success. In addition, it is possible to earn all attempted credits and have a GPA that places a student on academic probation (for example, a GPA of 1.0 or less, which varies by institution). In the

¹¹ Ivy Tech Community College, Indiana's system of public two-year colleges, bases remedial education placement on four factors: ACT, SAT, or PSAT scores; high school GPA; previous college coursework; and the Accuplacer assessment (Ivy Tech Community College, n.d.).

¹² Students who attend part time may do so for multiple reasons unrelated to early college success (such as family responsibilities or employment). Investigating enrollment intensity is beyond the scope of this analysis. (See Bozick & DeLuca, 2005; Chen & Carroll, 2007; and McCormick, Geis, & Vergun, 1995, for discussions of part-time enrollment.)

current sample, however, only approximately 80 of the full sample of 28,525 students achieve this indicator of success with a GPA of 1.0 or less. This measure was used in the analysis of the 2010 cohort of Indiana high school graduates and is aligned with the Indiana Commission for Higher Education's definition of its early college success composite measure.¹³

Whether students persisted to a second year. Early college success was displayed when a student who entered an Indiana public college in fall 2014 was still attending an Indiana public college in fall 2015. This definition did not include students who transferred to private or public or private out-of-state colleges before fall 2015 (such students would be counted as not persisting to a second year). For this reason, the number of students persisting to a second year of college was likely to be lower than was actually the case. Although this indicator is more distal from high school than the first two measures, it may ultimately be more important to policymakers because of its strong association with degree completion in the research literature. For example, in one national sample of beginning postsecondary students, students who were consecutively enrolled through the fall semester of their second year were more likely to earn a degree within five years (Horn, 1998).

Whether students achieved early college success by all three indicators. This composite measure indicated early college success if the student showed success by all three indicators: enrolling in only nonremedial courses in the first semester, earning all attempted credits in the first semester, and persisting to a second year. The Indiana Commission for Higher Education also uses this variable as a composite measure of early college success (Indiana Commission for Higher Education, n.d.). Although the analysis does not report whether students entering four-year colleges enrolled in only nonremedial coursework, about 6 percent of the four-year sample took remedial coursework in their first semester. Therefore, this variable is calculated in the same way for students entering both two- and four-year colleges using all three indicators of success.

Predictors of early college success

Student- and school-level predictors were included in analyses through multilevel modeling.

Demographic and socioeconomic characteristics. Separate dichotomous predictors were created for students' race/ethnicity, gender, English learner status, special education status, and disadvantaged status.

Race/ethnicity. Separate variables were created for whether a student was White, non-Hispanic, Black non-Hispanic, other race non-Hispanic, and any race Hispanic. For each separate variable, students were coded as "1" for yes and "0" for no. The other category consisted of students

¹³ Indiana Commission for Higher Education, <http://www.in.gov/che/4553.htm>, retrieved October 3, 2017.

identified as Asian (1.8 percent), Pacific Islander, (> 1.0 percent), American Indian/Alaska Native (> 1.0 percent), and two or more races (3.0 percent).

Gender. Females were coded as “1,” and males were coded as “0.”

English learner status. Students who were classified as English learner students at any time were coded as “1” and “0” if not.

Special education status. Students identified as having IEPs at any time were coded as “1” and “0” if not.

Eligibility for the free or reduced-price lunch program. This variable was a proxy for economic disadvantage during high school. Students who were eligible for a free or reduced-price lunch during high school were coded as “1” and “0” if not eligible.

Academic preparation. Five predictors assessed students’ level of academic preparation in high school: grade 8 standardized test scores, participation in dual-enrollment courses, taking and passing AP examinations, taking but not passing AP examinations, and types of high school diploma attained.

ISTEP+ mathematics test score in grade 8. The ISTEP+ is Indiana’s state standardized test. For research question 1, we calculated cutscores based on three quantiles of ISTEP+ mathematics test scores, representing the lower (340–580), middle (581–628), and upper (629–830) thirds of the distribution on these scores.

Participation in at least one dual-credit course. Students were coded as “1” if they participated in any dual-credit coursework during high school and “0” if not. We also examined dual credit awarded at the college level, but less than 1 percent of students who participated in at least one dual-credit course during high school were not awarded any credit upon college enrollment.

Taking and passing at least one AP examination. This variable was created from the original variables for the number of AP examinations taken and the number of AP examinations passed. These variables originated from the Indiana Department of Education, which uses the term *pass* to refer to students who scored a 3 or higher on a 1–5 scale (Eltz, 2016). In addition, the 2015 REL Midwest report that examined early college success among the 2010 cohort of Indiana high school graduates also used this terminology (Stephan et al., 2015). Students in this category earned a 3 or higher on at least one AP examination. If a student took any number of AP examinations and passed any number of AP examinations more than zero, that student was coded as “1” and “0” if not.

Taking but not passing at least one AP examination. This variable also was created from the original variables for the number of AP examinations taken and the number of AP examinations passed. If a student took any number of AP examinations, and the number of AP examinations passed was zero, that student was coded as “1” and “0” if not.

Diploma type. The project team created three dichotomous indicators of diploma type: general diplomas, Core 40 diplomas, and Core 40 diplomas with honors (which included Core 40 diplomas with academic honors, Core 40 diplomas with technical honors, Core 40 diplomas with both academic and technical honors, and International Baccalaureate diplomas). For each variable, students were coded as “1” for the type of diploma they earned and “0” otherwise.

Attendance. We created cutscores based on three quantiles of cumulative high school absences defined by total excused and unexcused absences between the 2010–11 and 2013–14 school years. These quantiles represented the lower (13 days or less), middle (more than 13 days, up to 27 days), and upper (more than 27 days) thirds of the distribution of total absences during high school.

Financial aid. Separate dichotomous predictors were used to indicate whether students received financial aid.

Whether students received any financial aid. The research team created codes indicating whether students received any kind of financial aid, including institutional, state, or federal grants or loans. Students were coded as “1” if they received any financial aid and “0” if not.

Whether students received Pell Grants. Students were coded as “1” if they received Pell Grants and “0” if not.

Whether students received 21st Century Scholarships. Students were coded as “1” if they received 21st Century Scholarships and “0” if not.

High school characteristics. School characteristics were entered into Level 2 of the multilevel models. Characteristics included school-level academic performance and the degree to which the school was populated with students who were economically disadvantaged.

School-level academic performance. School-level academic performance was defined as the percentage (between 0 and 100) of grade 10 students who passed the English end-of-course examination in 2014.

School-level degree of economic disadvantage. The school-level degree of economic disadvantage was defined as the percentage (between 0 and 100) of students in the school who were eligible for the federal free or reduced-price lunch program. For the analysis, REL Midwest analysts separated high schools into three categories based on the upper (48 percent or higher), middle

(between 30 percent and 48 percent), and lower (less than 30 percent) percentages of students eligible for the free or reduced-price lunch program.

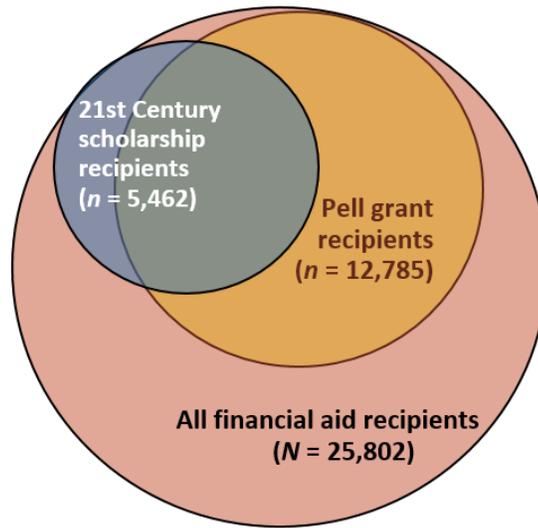
College characteristics. The only college characteristic considered in the current analysis was two-year versus four-year Indiana public colleges. The analysis did not examine any other characteristics of the colleges in which students enrolled, such as selectivity, because prior research suggests that these characteristics are unrelated to early college success after controlling for other student- and high school-level characteristics (Stephan et al., 2015).

Analytic methods

The research team addressed the research questions using a combination of descriptive statistics and stepwise HGLMs. To address research question 1, the team tabulated the percentages of students who exhibited early college success for each indicator by the group categories (described in the Measures section in this appendix). These tabulations were conducted for all students and by institution type (that is, two-year versus four-year colleges). Because the data were from the entire population of graduates from 2014, tests for significant differences were not required.

To address research question 2, the project team conducted a series of stepwise HGLMs, estimating the predictive value of each financial aid variable separately for each early college success outcome (taking only nonremedial coursework in the first semester, earning all attempted credits in the first semester, persisting to a second year, and the composite variable). Cases of missing school-level variables were excluded from the analyses. HGLMs were run separately for students entering two-year and four-year colleges. Models predicting enrollment in only nonremedial coursework were run only for students entering two-year colleges. REL Midwest analysts conducted stepwise HGLM analyses because of how the financial aid variables related to one another (see figure A2). Odds ratios for the financial aid variables at each step of the seven HGLM analyses are presented in table B3 in appendix B.

Figure A2. For students receiving financial aid, 37 percent of those receiving Pell Grants also received 21st Century Scholarships, fall 2014



Source: Authors' analysis.

The models for identifying statistically significant predictors and the associations among types of financial aid were as follows:

- **Dependent variables derived through logit link.** The dichotomous indicators of early college success were converted to logic links such that

$$\eta_{ij} = \log\left(\frac{u_{ij}}{1-u_{ij}}\right),$$

where η_{ij} = log odds of success for student i in high school j and u_{ij} = the probability of success for student i in high school j .

- **Hierarchical linear models**

- *Level 1 model: Students-within-schools*

$$\eta_{ij} = \beta_{0j} + \sum_{p=1}^P \beta_{1j} a_{pij} + e_{ij}$$

where i is the number of students ($i = 1, \dots, n_j$) in school j , j is the number of high schools ($j = 1, \dots, J$), a_{pij} is the p th student characteristic for student i in high school j ($p = 1, \dots, P$), and e_{ij} is the random error term for student i in high school j .

- *Level 2 model: Schools.* The intercept from the Level 1 model (β) becomes the dependent variable in the Level 2 model:

$$\beta_{0j} = \gamma_{00} + \sum_{r=1}^R \gamma_{0r} W_{0rj} + u_j$$

where W_{0rj} is the r th characteristic for high school j ($r = 1, \dots, R$) and u_j is the random error for high school j .

Analysts tested for multicollinearity by first examining pairwise correlations between all variables included in the HGLMs and then scanning for dramatically changing coefficients after the addition of each step in the HGLM analyses.

The stepwise variable entry approach allowed analysts to enter the financial aid variables one at a time, starting with overall aid status, then adding in Pell Grants and finally 21st Century Scholarships, to observe the unique predictive contribution of each variable. Step 1 included students' overall aid status, controlling for student-level demographic, attendance, and academic characteristics plus high school-level characteristics that previous research has shown to be predictive of early college success (Stephan et al., 2015). Step 2 added whether a student received a Pell Grant, controlling for all variables included in Step 1; and Step 3 added whether a student received a 21st Century Scholarship, controlling for all variables in Steps 1 and 2. Step 3 of each HGLM, or the final models, essentially showed four categories of aid: did not receive aid (comparison category), received aid other than Pell Grants and 21st Century Scholarships, received Pell Grants only, and received 21st Century Scholarships only.

Student-level demographic variables included students' eligibility status for the free or reduced-price lunch program. Although both this and Pell Grant recipient status are proxy indicators for students from low-income households, these two variables were not highly correlated. The analysis included a sensitivity analysis to check for multicollinearity, and removing the free or reduced-price lunch program variable did not have an impact on the coefficients in the regression models.

To help readers interpret the HGLM results, the change in the predicted probability of achieving early college success associated with a unit change in a predictor was presented for a typical student in the sample. Presenting results for a typical student was made possible by centering the predictors about their overall means separately for students who first entered a two-year college and those who first entered a four-year college. The term *typical* thus represented an average student in the analytic samples.

Appendix B. Additional tables

Table B1. Percentage of students entering two-year colleges achieving early college success, by student and high school characteristics

Predictors	Students entering two-year colleges (N = 9,100)									
	Full sample		Took only nonremedial coursework		Earned all attempted credits first year		Persisted to second year of college		Early college success by all indicators	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Student Characteristics										
Gender										
Male	4,338	48	2,664	61	1,322	30	2,141	49	649	15
Female	4,762	52	2,560	54	1,535	32	2,423	51	705	15
Race										
White	6,613	73	4,150	63	2,304	35	3,493	53	1,160	18
Black	1,375	15	483	35	236	17	502	37	60	4
Hispanic	641	7	345	54	196	31	348	54	82	13
Other	471	5	246	52	121	26	221	47	52	11
Student was eligible for free or reduced-price lunch program										
No	5,004	55	3,199	64	1,867	37	2,809	56	952	19
Yes	3,933	43	1,939	49	944	24	1,703	43	385	10
Unknown	163	2	86	53	46	28	52	32	17	10
Student was/is an English learner student										
No	8,379	92	4,842	58	2,624	31	4,189	50	1,270	15
Yes	590	7	311	53	193	33	332	56	69	12
Unknown	131	1	71	54	40	31	43	33	15	11
Student had an individualized education program (IEP)										
No	7,747	85	4,708	61	2,476	32	3,932	51	1,230	16
Yes	1,222	13	445	36	341	28	589	48	109	9
Unknown	131	1	71	54	40	31	43	33	15	11

Predictors	Students entering two-year colleges (N = 9,100)									
	Full sample		Took only nonremedial coursework		Earned all attempted credits first year		Persisted to second year of college		Early college success by all indicators	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Student high school diploma type										
General	1,561	17	581	37	290	19	603	39	96	6
Core 40	6,174	68	3,503	57	1,872	30	3,132	51	778	13
Core 40 honors	1,050	12	957	91	612	58	719	68	438	42
Not applicable	315	4	183	58	83	26	110	35	42	13
Student participated in dual credit										
No	5,192	57	2,522	49	1,417	27	2,391	46	552	11
Yes	3,908	43	2,702	69	1,440	37	2,173	56	802	21
Student earned dual credit										
No	5,291	58	2,573	49	1,433	27	2,430	46	558	11
Yes	3,809	42	2,651	70	1,424	37	2,134	56	796	21
Advanced Placement (AP) examinations										
Student did not take an AP examination	7,924	87	4,252	54	2,352	30	3,830	48	1,018	13
Student took at least one AP examination but did not pass any	908	10	730	80	363	40	546	60	228	25
Student took and passed at least one AP examination	268	3	242	90	142	53	188	70	108	40
ISTEP+ grade 8 mathematics score										
340–580	5,098	60	2,203	43	1,417	28	2,422	48	503	10
581–628	2,469	29	1,827	74	876	35	1,310	53	490	20
629–830	937	11	866	92	378	40	549	59	271	29
Total absences during high school										
0.0–13.0	2,351	26	1,379	59	947	40	1,389	59	489	21
14–28	2,701	30	1,574	58	903	33	1,427	53	427	16
29– or more	4,043	45	2,267	56	1,004	25	1,745	43	437	11

Predictors	Students entering two-year colleges (N = 9,100)									
	Full sample		Took only nonremedial coursework		Earned all attempted credits first year		Persisted to second year of college		Early college success by all indicators	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Student received financial aid										
No	2,224	24	1,531	69	872	39	1,158	52	409	18
Yes	6,876	76	3,693	54	1,985	29	3,406	50	945	14
Student received Pell Grant										
No	3,842	42	2,535	66	1,519	40	2,181	57	777	20
Yes	5,258	58	2,689	51	1,338	25	2,383	45	577	11
Student received 21st Century Scholarship										
No	7,611	84	4,409	58	2,426	32	3,784	50	1,140	15
Yes	1,489	16	815	55	431	29	780	52	214	14
High school characteristics										
Rural high school										
No	6,052	67	3,397	56	1,788	30	2,974	49	829	14
Yes	2,624	29	1,575	60	931	35	1,372	52	457	17
Not applicable	424	5	252	59	138	33	218	51	68	16
Percentage of students eligible for the free or reduced-price lunch program										
Less than 30 percent	1,808	23	1,177	65	666	37	1,037	57	337	19
30–48 percent	2,941	38	1,795	61	1,005	34	1,531	52	492	17
More than 48 percent	3,061	39	1,473	48	767	25	1,343	44	314	10
Percentage of students in grade 10 who passed the end-of-course examination in English										
Less than 78 percent	3,424	43	1,741	51	911	27	1,569	46	378	11
78–86 percent	2,777	35	1,641	59	979	35	1,445	52	486	18
More than 86 percent	1,780	22	1,167	66	613	34	1,002	56	313	18

ISTEP+ is Indiana Statewide Testing for Educational Progress—Plus.
Source: Authors' analyses.

Table B2. Percentage of students entering four-year colleges achieving early college success, by student and high school characteristics

Predictors of interest	Students entering four-year colleges (N = 19,425)							
	Full sample		Earned all attempted credits first year		Persisted to second year		Early college success by all indicators	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Student characteristics								
Gender								
Male	8,348	43	5,036	60	6,661	80	4,392	53
Female	11,077	57	7,420	67	8,881	80	6,301	57
Race								
White	15,988	82	10,680	67	12,933	81	9,187	57
Black	1,459	8	589	40	1,029	71	468	32
Hispanic	936	5	553	59	743	79	480	51
Other	1,042	5	634	61	837	80	558	54
Student was eligible for free or reduced-price lunch program								
No	14,567	75	9,972	68	12,123	83	8,680	60
Yes	4,700	24	2,382	51	3,298	70	1,933	41
Unknown	158	1	102	65	121	77	80	51
Student was/is an English learner								
No	18,383	95	11,803	64	14,666	80	10,116	55
Yes	921	5	570	62	778	84	511	55
Unknown	121	1	83	69	98	81	66	55
Student had an IEP								
No	18,756	97	12,094	64	15,045	80	10,407	55
Yes	548	3	279	51	399	73	220	40
Unknown	121	1	83	69	98	81	66	55

Predictors of interest	Students entering four-year colleges (N = 19,425)							
	Full sample		Earned all attempted credits first year		Persisted to second year		Early college success by all indicators	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Student high school diploma type								
General	67	0	25	37	39	58	16	24
Core 40	7,087	37	3,029	43	4,658	66	2,225	31
Core 40 honors	12,027	62	9,227	77	10,644	89	8,298	69
Not applicable	244	1	175	72	201	82	154	63
Student attempted dual credit								
No	5,908	30	3,262	55	4,287	73	2,653	45
Yes	13,517	70	9,194	68	11,255	83	8,040	59
Student earned dual credit								
No	5,996	31	3,297	55	4,343	72	2,680	45
Yes	13,429	69	9,159	68	11,199	83	8,013	60
AP examinations								
Student did not take an AP examination	8,466	44	4,553	54	6,025	71	3,565	42
Student took at least one AP examination but did not pass any	5,212	27	3,358	64	4,274	82	2,896	56
Student took and passed at least one AP examination	5,747	30	4,545	79	5,243	91	4,232	74
ISTEP+ grade 8 mathematics score								
340–580	4,050	22	1,994	49	2,834	70	1,472	36
581–628	6,509	35	3,923	60	5,063	78	3,269	50
629–830	7,947	43	5,954	75	6,943	87	5,465	69
Total absences during high school								
0.0–13.0	7,549	39	5,442	72	6,562	87	4,912	65
14–28	6,443	33	4,107	64	5,170	80	3,522	55
29 or more	5,418	28	2,896	53	3,799	70	2,250	42

Predictors of interest	Students entering four-year colleges (N = 19,425)							
	Full sample		Earned all attempted credits first year		Persisted to second year		Early college success by all indicators	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Student received financial aid								
No	2,499	13	1,614	65	1,928	77	1,320	53
Yes	16,926	87	10,842	64	13,614	80	9,373	55
Student received Pell Grant								
No	11,898	61	8,335	70	9,967	84	7,270	61
Yes	7,527	39	4,121	55	5,575	74	3,423	45
Student received 21st Century Scholarship								
No	15,452	80	10,294	67	12,532	81	8,864	57
Yes	3,973	21	2,162	54	3,010	76	1,829	46
High school characteristics								
Rural high school								
No	13,856	71	8,766	63	11,113	80	7,565	55
Yes	4,251	22	2,801	66	3,338	79	2,350	55
Not applicable	1,318	7	889	67	1,091	83	778	59
Percentage of students eligible for free or reduced-price lunch program								
Less than 30 percent	6,064	39	4,194	69	5,154	85	3,744	62
30-48 percent	5,126	33	3,300	64	4,052	79	2,774	54
More than 48 percent	4,444	28	2,401	54	3,244	73	1,989	45
Percentage of students in grade 10 passing English end-of-course examination								
Less than 78 percent	5,071	30	2,910	57	3,788	75	2,419	48
78–86 percent	5,595	33	3,534	63	4,437	79	3,012	54
More than 86 percent	6,327	37	4,441	70	5,407	85	3,956	63

Source: Authors' analyses.

Table B3. Odds ratios associated with financial aid variables for each stepwise HGLM analysis, after controlling for student- and school-level characteristics

Predictor variable	Step 1		Step 2		Step 3	
	Odds ratio	Significance	Odds ratio	Significance	Odds ratio	Significance
Students entering two-year colleges						
<i>Took only nonremedial coursework</i>						
Overall aid status	0.70	***	0.66	***	0.67	***
Pell Grant			1.08		1.08	
21st Century Scholarship					0.96	
<i>Earned all attempted credits</i>						
Overall aid status	0.84	**	0.96		0.96	
Pell Grant			0.79	**	0.79	**
21st Century Scholarship					1.06	
<i>Persisted to a second year</i>						
Overall aid status	1.29	***	1.59	***	1.55	***
Pell Grant			0.71	***	0.70	***
21st Century Scholarship					1.25	***
<i>Achieved success by all indicators</i>						
Overall aid status	1.06		1.2	*	1.18	
Pell Grant			0.74	***	0.72	***
21st Century Scholarship					1.20	
Students entering four-year colleges						
<i>Earned all attempted credits</i>						
Overall aid status	1.01		1.08		1.08	
Pell Grant			0.82	***	0.83	***
21st Century Scholarship					0.97	
<i>Persisted to a second year</i>						
Overall aid status	1.43	***	1.2	*	1.46	***

Predictor variable	Step 1		Step 2		Step 3	
	Odds ratio	Significance	Odds ratio	Significance	Odds ratio	Significance
Pell Grant			0.74	**	0.87	**
21st Century Scholarship					1.26	***
Achieved success by all indicators						
Overall aid status	1.18	**	1.22	***	1.22	***
Pell Grant			0.88	**	0.87	**
21st Century Scholarship					1.08	

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

Source: Authors' analyses.

Table B4. HGLM results predicting taking only nonremedial coursework in the first semester, earning all attempted credits in the first year, persisting to a second year of college, and success by all indicators among Indiana high school graduates entering Indiana public two-year colleges in fall 2014

Predictors of interest	Early college success—Students enrolling in two-year colleges											
	Took only nonremedial coursework first semester			Earned all credits first year			Persistence to second year			Success by all indicators		
	OR	CI	p-value	OR	CI	p-value	OR	CI	p-value	OR	CI	p-value
Student received financial aid	0.7	(0.573,0.775)	0.000	1.0	(0.832,1.104)	0.557	1.6	(1.356,1.782)	0.000	1.2	(0.995,1.394)	0.057
Student received Pell Grant	1.1	(0.944,1.238)	0.261	0.8	(0.688,0.897)	0.001	0.7	(0.613,0.797)	0.000	0.7	(0.613,0.856)	0.000
Student received 21st Century Scholarship	1.0	(0.840,1.098)	0.551	1.1	(0.919,1.216)	0.437	1.2	(1.113,1.401)	0.000	1.2	(0.992,1.458)	0.060
Student-level covariates												
Student participated in dual-credit coursework	1.5	(1.315,1.610)	0.000	1.1	(0.951,1.171)	0.308	1.1	(1.021,1.225)	0.016	1.2	(1.044,1.374)	0.010
Student took at least one AP examination but did not pass any	1.7	(1.426,2.062)	0.000	1.0	(0.819,1.156)	0.756	1.2	(1.040,1.404)	0.014	1.1	(0.904,1.374)	0.309
Student took and passed at least one AP examination	2.8	(1.827,4.445)	0.000	1.4	(1.094,1.826)	0.008	1.6	(1.194,2.227)	0.003	1.9	(1.429,2.486)	0.000
Core 40 diploma	1.3	(1.179,1.522)	0.000	1.6	(1.415,1.887)	0.000	1.5	(1.281,1.650)	0.000	1.4	(1.124,1.725)	0.003
Core 40 with honors diploma	4.7	(3.546,6.117)	0.000	4.2	(3.337,5.166)	0.000	2.3	(1.851,2.812)	0.000	4.0	(3.029,5.235)	0.000
Student qualified for free or reduced-price lunch	0.9	(0.798,1.013)	0.079	0.8	(0.707,0.897)	0.000	0.8	(0.679,0.851)	0.000	0.8	(0.671,0.943)	0.009
Student was an English learner	0.8	(0.613,1.082)	0.157	1.3	(0.988,1.793)	0.060	1.4	(1.096,1.783)	0.007	0.8	(0.522,1.154)	0.211
Student participated in special education program	0.6	(0.512,0.679)	0.000	1.0	(0.883,1.195)	0.729	1.1	(0.926,1.201)	0.427	0.8	(0.629,0.959)	0.019

Predictors of interest	Early college success—Students enrolling in two-year colleges											
	Took only nonremedial coursework first semester			Earned all credits first year			Persistence to second year			Success by all indicators		
	OR	CI	p-value	OR	CI	p-value	OR	CI	p-value	OR	CI	p-value
Female	0.8	(0.706,0.877)	0.000	1.2	(1.074,1.318)	0.001	1.2	(1.053,1.264)	0.003	1.1	(0.970,1.269)	0.129
Black	0.7	(0.561,0.787)	0.000	0.6	(0.502,0.713)	0.000	0.7	(0.620,0.847)	0.000	0.5	(0.338,0.608)	0.000
Hispanic	0.9	(0.680,1.153)	0.368	0.8	(0.620,1.093)	0.179	1.1	(0.861,1.394)	0.460	1.1	(0.723,1.604)	0.716
Other (race)	0.9	(0.718,1.133)	0.376	0.8	(0.606,0.979)	0.032	0.9	(0.713,1.100)	0.272	0.8	(0.576,1.128)	0.209
Grade 8 mathematics ISTEP+ score	1.0	(1.013,1.015)	0.000	1.0	(0.999,1.001)	0.806	1.0	(0.999,1.001)	0.387	1.0	(1.003,1.007)	0.000
Flag for imputed grade 8 mathematics ISTEP+ score	0.6	(0.497,0.738)	0.000	1.1	(0.937,1.409)	0.182	1.0	(0.862,1.244)	0.711	1.2	(0.937,1.486)	0.161
Total excused and unexcused high school absences	1.0	(1.000,1.004)	0.036	1.0	(0.989,0.994)	0.000	1.0	(0.991,0.995)	0.000	1.0	(0.987,0.994)	0.000
School-level covariates												
School-level English grade 10 end-of-course assessment pass rates	1.5	(0.673,3.564)	0.304	0.7	(0.342,1.473)	0.358	0.7	(0.401,1.234)	0.220	1.8	(0.601,5.639)	0.285
Percentage eligible for free or reduced-price lunch program	0.7	(0.422,1.217)	0.218	0.5	(0.301,0.746)	0.002	0.4	(0.259,0.580)	0.000	0.6	(0.293,1.165)	0.127
High school: rural	0.8	(0.718,0.976)	0.023	1.0	(0.916,1.170)	0.576	0.9	(0.830,1.032)	0.163	0.9	(0.795,1.082)	0.338

OR is odds ratio. CI is confidence interval.

Note: Odds ratios greater than 1 indicate a positive relationship, and odds ratios less than zero indicate a negative relationship; CI is the 95 percent confidence boundaries around the value for the odds ratio. CIs including the value 1 are not statistically significant.

Source: Authors' analysis.

Table B5. HGLM results predicting earning all attempted credits in the first year of college, persisting to a second year of college, and success by all indicators among Indiana high school graduates entering Indiana public four-year colleges in fall 2014

Predictors of interest	Early college success—Students enrolling in four-year colleges								
	Earned all credits first year			Persistence to second year			Success by all indicators		
	OR	CI	p-value	OR	CI	p-value	OR	CI	p-value
Student received financial aid	1.1	(0.975,1.195)	0.141	1.5	(1.299,1.648)	0.000	1.2	(1.106,1.339)	0.000
Student received Pell Grant	0.8	(0.764,0.901)	0.000	0.9	(0.784,0.962)	0.007	0.9	(0.799,0.939)	0.001
Student received 21st Century Scholarship	1.0	(0.883,1.056)	0.446	1.3	(1.114,1.414)	0.000	1.1	(0.977,1.187)	0.136
Student-level covariates									
Student attempted dual credit	1.1	(0.969,1.142)	0.229	1.3	(1.166,1.378)	0.000	1.1	(1.021,1.199)	0.014
Student took at least one AP examination but did not pass any	1.0	(0.906,1.074)	0.757	1.3	(1.157,1.417)	0.000	1.1	(1.000,1.189)	0.050
Student took and passed at least one AP examination	1.4	(1.293,1.566)	0.000	2.0	(1.793,2.330)	0.000	1.6	(1.438,1.767)	0.000
Core 40 with honors diploma	2.9	(2.665,3.160)	0.000	2.3	(2.095,2.563)	0.000	2.8	(2.548,2.994)	0.000
Student qualified for free or reduced-price lunch	0.9	(0.787,0.969)	0.011	0.7	(0.635,0.790)	0.000	0.8	(0.761,0.942)	0.003
Student was an English learner	1.1	(0.935,1.298)	0.246	1.6	(1.277,1.998)	0.000	1.1	(0.977,1.345)	0.094
Student participated in special education program	1.1	(0.881,1.311)	0.479	1.1	(0.913,1.401)	0.259	1.1	(0.886,1.331)	0.430
Female	1.5	(1.419,1.619)	0.000	1.1	(1.014,1.181)	0.021	1.4	(1.296,1.487)	0.000
Black	0.7	(0.600,0.802)	0.000	1.2	(1.027,1.449)	0.024	0.8	(0.658,0.875)	0.000
Hispanic	1.0	(0.854,1.220)	0.818	1.1	(0.917,1.437)	0.228	1.1	(0.936,1.327)	0.225
Other (race)	0.8	(0.722,0.947)	0.006	1.0	(0.871,1.247)	0.653	0.9	(0.786,1.021)	0.098
Grade 8 mathematics ISTEP+ score	1.0	(1.002,1.003)	0.000	1.0	(1.000,1.002)	0.035	1.0	(1.004,1.005)	0.000
Flag for imputed grade 8 mathematics ISTEP+ score	1.0	(0.902,1.221)	0.530	0.8	(0.700,0.980)	0.028	1.0	(0.886,1.159)	0.849
Total excused and unexcused high school absences	1.0	(0.987,0.991)	0.000	1.0	(0.984,0.989)	0.000	1.0	(0.982,0.986)	0.000

Predictors of interest	Early college success—Students enrolling in four-year colleges								
	Earned all credits first year			Persistence to second year			Success by all indicators		
	OR	CI	p-value	OR	CI	p-value	OR	CI	p-value
School-level covariates									
School-level English grade 10 end-of-course assessment pass rates	0.7	(0.374,1.199)	0.177	0.8	(0.426,1.677)	0.630	0.7	(0.408,1.294)	0.279
Percentage eligible for free or reduced-price lunch	0.4	(0.250,0.518)	0.000	0.2	(0.148,0.360)	0.000	0.3	(0.210,0.453)	0.000
High school: rural	1.1	(0.957,1.167)	0.274	0.9	(0.786,0.988)	0.030	1.0	(0.900,1.080)	0.755

OR is odds ratio. CI is Confidence Interval.

Note: Odds ratios greater than 1 indicate a positive relationship, and odds ratios less than zero indicate a negative relationship; CI is the 95 percent confidence boundaries around the value for the odds ratio. CIs including the value 1 are not statistically significant.

Source: Authors' analysis.

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REL Midwest at American Institutes for Research
10 South Riverside Plaza, Suite 600
Chicago, IL 60606
312.288.7600 | RELMidwest@air.org