Institute of Education Sciences

The Cost-Effectiveness of Providing Early College Programs in Rhode Island

Regional Educational Laboratory Northeast & Islands

At Education Development Center, Inc.

April 2025
REL 2025-012
U.S. DEPARTMENT OF EDUCATION

A Publication of the National Center for Education Evaluation and Regional Assistance at IES

U.S. Department of Education
Linda McMahon
Secretary

Institute of Education Sciences
Matthew Soldner
Acting Director

National Center for Education Evaluation and Regional Assistance
Matthew Soldner
Commissioner

Sarah Brasiel
Project Officer

In addition to the current IES staff mentioned above, the following former IES staff provided helpful guidance on the development of the report and substantive feedback on drafts: Eric Mason, project officer; Chris Boccanfuso, REL Branch Chief; and Liz Eisner, Associate Commissioner.

The Institute of Education Sciences (IES) is the independent, nonpartisan statistics, research, and evaluation arm of the U.S. Department of Education. The IES mission is to provide scientific evidence on which to ground education practice and policy and to share this information in formats that are useful and accessible to educators, parents, policymakers, researchers, and the public.

We strive to make our products available in a variety of formats and in language that is appropriate for a variety of audiences. You, as our customer, are the best judge of our success in communicating information effectively. If you have any comments or suggestions about this or any other IES product or report, we would like to hear from you. Please direct your comments to ncee.feedback@ed.gov.

This report was prepared for IES under Contract 91990022C0013 by Regional Educational Laboratory Northeast & Islands, administered by Education Development Center. The content of the publication does not necessarily reflect the views or policies of IES or the U.S. Department of Education nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

April 2025

Shields, K. A., Jacobson, A., Hadley, L., Aubele, J, & Hanita, M. (2025). *The cost-effectiveness of providing early college programs in Rhode Island.* (REL 2025-012). U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance. https://ies.ed.gov/use-work/resource-library/reports.

ORCID iDs
Katherine Shields https://orcid.org/0000-0003-3991-294X
Alexander Jacobson https://orcid.org/0009-0006-3788-629X
Lucy Hadley https://orcid.org/0000-0002-2219-2926
Joseph Aubele https://orcid.org/0000-0002-8712-3649
Makoto Hanita https://orcid.org/0009-0007-4021-5435

This report is available on the Institute of Education Sciences website at https://ies.ed.gov/use-work/resource-library/reports/.

The Cost-Effectiveness of Providing Early College Programs in Rhode Island

Katherine A. Shields, Alexander Jacobson, Lucy Hadley, Joseph Aubele, and Makoto Hanita

April 2025

This study examined the cost-effectiveness of three early college programs in Rhode Island: dual enrollment, concurrent enrollment, and Advanced Placement (AP). Each program had a positive effect on participants' enrolling in college within one year of high school graduation, persisting to a second year of college, and starting at a four-year college. For the most part, students experienced these positive effects regardless of whether they were academically proficient at the start of high school. The average annual estimated incremental cost per student for each program (the cost beyond that of providing business-as-usual programs) varied considerably by local education agency. AP had the lowest estimated cost per student. Concurrent enrollment had a somewhat higher estimated cost per student, though the cost reported in this study does not include the substantial expense of obtaining the graduate-level training required for high school teachers who teach these courses. Dual enrollment had the highest estimated cost per student for three key reasons. First, dual enrollment typically served a very small number of participants over whom fixed costs could be spread. Second, the fees paid to postsecondary institutions represented a relatively large portion of the program cost. Finally, some local education agencies dedicated more staff time to dual enrollment to support students in registering, persisting, and ultimately succeeding. While the size of program effects was similar across the three programs, the difference in costs meant that the cost per outcome was lowest for the AP program. The study findings should be considered in the context of the population of students served by dual enrollment. Compared with concurrent enrollment and AP, dual enrollment reaches more students from populations that have been less likely to enroll in college, such as students eligible for the National School Lunch Program. These students may have different support needs. Future research could provide policymakers valuable contextual information through a more comprehensive analysis of broader societal benefits such as workforce participation that are attributable to these programs, which was beyond the scope of this study.

Why this study?

Education decisionmakers in Rhode Island's K-12 and postsecondary education agencies seek evidence to inform the targeting of resources to increase college readiness among the state's youth. Rhode Island aims to increase college degree attainment from the current rate of 58 percent, which lags regional peers (New England Secondary School Consortium, 2023). Rhode Island is also concerned about gaps in college completion between lower-income students and higher-income students (41 percent versus 71 percent for students who started college in 2016) (New England Secondary School Consortium, 2023).

To address these concerns, the state has invested in expanding opportunities for high school students to take postsecondary and Advanced Placement (AP) courses, which are referred to as *early college programs* in this report (see box 1 for definitions of key terms).[1] Research indicates that students who arrive at college with a higher level of knowledge and skills in core academic areas, familiar with the expectations regarding college-level work, and having previously taken a course on a college campus may be more likely to persist and succeed

For additional information, including background on the study, technical methods, supporting analysis, and other analyses, see the appendices for the report on the [Institute of Education Sciences](#) website.

1. In Rhode Island these programs are collectively referred to as *early college opportunities*. However, this term has a more specific meaning in some other states (see appendix A).

in college (Edwards et al., 2011). Rigorous studies have also demonstrated that programs that allow students to earn college credit during high school have positive impacts on college enrollment, persistence, and completion (An, 2013; Edmunds et al., 2018; Giani et al., 2014; Haxton et al., 2016; Rosen et al., 2023; Shields et al., 2021; Struhl & Vargas, 2012).

To make early college programs more widely available, state legislators established a fund in 2015 to support students in earning college credit during high school through dual enrollment and concurrent enrollment programs (PrepareRI, 2018; Rhode Island General Laws 16-100). Through Rhode Island's PrepareRI Dual Enrollment Fund, high school students can dual-enroll in college courses on a college campus.[2] The fund also supports students who pursue concurrent enrollment courses, which take place at the high school and are taught by high school teachers who meet the requirements of the college so that the course can be recognized for college credit. In addition, the state has promoted and increased access to AP courses through such initiatives as Computer Science for Rhode Island (Rhode Island Department of Education, n.d.). Many postsecondary institutions in and out of the state provide course credit based on AP test scores.

As a result of these investments, participation in these early college programs between 2015/16 and 2020/21 increased by 94 percent for dual enrollment, by 40 percent for concurrent enrollment, and by 9 percent for AP test-taking[3] (Rhode Island Department of Education, n.d.). Compared with other early college programs in Rhode Island, dual enrollment serves a higher proportion of students who are from populations that have been less likely to attend college, such as Black and Hispanic students and students eligible for the National School Lunch Program. However, despite high growth, dual enrollment remains the smallest of the early college programs, with 825 participants in grade 9–12 in 2022/23, compared with 5,127 in concurrent enrollment and 6,417 AP test-takers (Rhode Island Department of Education, 2023).

Through a partnership among the Rhode Island Department of Education (RIDE), the Rhode Island Office of the Postsecondary Commissioner (RIOPC), and the Regional Educational Laboratory (REL) Northeast & Islands, an earlier REL Northeast & Islands research study found that participating in any one of these early college programs had positive effects on students' high school graduation and college enrollment rates (Shields et al., 2021). However, that study also pointed to gaps in access to the programs based on gender, race/ethnicity, and school location. Aiming to expand benefits to a wider range of students, RIDE and RIOPC want to understand the effects of each program individually, to examine additional outcomes such as four-year college enrollment and college persistence, and to identify any differences in effects related to academic proficiency at the start of high school that should be considered when deciding whether to expand a program. Finally, state partners seek evidence regarding estimated costs and cost-effectiveness to inform plans to broaden access to the programs.

Estimated costs are especially important in the Rhode Island early college context. Because the programs (and the resources that support them) are implemented through distinct program models and funded through different mechanisms, the state needs detailed cost information to properly identify resources for each program. In addition, each program requires a different mix of resources that need to be considered in expansion decisions (see appendix A for program descriptions and appendix B for details on resources). In particular, dual enrollment tends to reach more students from populations that have been less likely to enroll in college in the state than concurrent enrollment and AP (Shields et al., 2021), and evidence from other studies suggests that dual enrollment students from these populations need additional resources to cover a wider set of support activities and facilitate their success in the program (Fink & Jenkins, 2023; Hooker et al., 2021).

2. While students can also take dual enrollment courses online, virtual participation was not common during the study period, according to Rhode Island Department of Education administrators.
3. AP test-taking is used as a proxy for a student's AP course enrollment because course enrollment data are unavailable at the state level.

Box 1. Key terms

Advanced Placement (AP). A program offering high school courses that culminate in a standardized subject area assessment administered by the College Board. Many colleges, including all three Rhode Island public colleges, give students course credit based on their AP test scores. In this study's analyses of student outcomes, AP test-taking is used as a proxy for a student's AP course enrollment because course enrollment data are unavailable at the state level.

College enrollment. For this study, having an enrollment record at a postsecondary institution—including public, private, two- and four-year, and out-of-state institutions—within 12 months of on-time high school graduation. This outcome was analyzed among students who graduated from high school.

College persistence. For this study, having initially enrolled in a postsecondary institution within 12 months of on-time high school graduation and having an enrollment record at a postsecondary institution—including public, private, two- and four-year, and out-of-state institutions—24 months after on-time high school graduation. This outcome was analyzed among students who graduated from high school.

Concurrent enrollment. A program that allows high school students to take approved college courses taught by instructors on staff at the students' high school. Students earn course credit that is accepted by the high school as well as by the college. In Rhode Island, students do not pay tuition or other fees for concurrent enrollment courses. The instructor, although employed by the high school, must be approved by the college.

Cost. For this study, the dollar value of the personnel and nonpersonnel resources associated with implementation of an early college program. Such costs capture the opportunity cost (the value of the good if applied in the next most appropriate use) for the full set of resources required, including resources that are shared between programs rather than only those explicitly allocated to and reported for a single program. Moreover, such costs differ from those in an expenditure or budgetary analysis because they are not based primarily on data from the planned program design but use implementation data to document the comprehensive set of program resources.

Cost-effectiveness. For this study, the ratio of the estimated average annual incremental cost per student to the predicted average incremental difference in the probability of attaining the outcome related to program participation, also referred to as cost per outcome.

Dual enrollment. A program that allows high school students to attend college courses taught by college faculty at a public or private college. Students take the courses on the college campus, or online if the college offers the course in that format. Students earn course credit that is accepted by the high school as well as by the college. During the study period Rhode Island paid for the cost of dual enrollment courses at the state's public colleges. Districts are responsible for the cost of books and equipment for dual enrollment courses. Students are responsible for the costs of dual enrollment at private postsecondary institutions. Each institution has its own eligibility criteria, such as a minimum grade point average. This study examines dual enrollment in public colleges only.

Early college program. A program that enables high school students to earn college credit. Three such programs were included in this study: dual enrollment, concurrent enrollment, and AP.

Estimated cost per student. The estimated total cost (generated through the cost analysis) of an early college program at a local education agency (LEA) divided by the number of participating students for a given year.

Incremental cost. The difference in the estimated cost of a program of interest when compared with a comparable program or business-as-usual condition. If the program of interest requires only resources that are supplemental to the business-as-usual condition, the program's estimated total cost is equivalent to the incremental cost. However, in many cases a program resource substitutes for a comparable use of resources in the business-as-usual condition, in which case the incremental cost is the difference between the program's estimated total cost and the total business-as-usual cost. It is possible for an incremental cost to be zero when there is no difference between a program resource and its comparable business-as-usual resource.

Predicted probability. The likelihood of an outcome estimated using a set of predictor variables in a statistical analysis. For example, the study team used a statistical model based on students' grade 8 characteristics and academic achievement to predict how likely they were to attain an outcome. The results are presented as predicted probabilities for different groups—that is, given what is known about a group of students, the value represents how likely they are to attain the outcome.

Unweighted average cost. The estimated cost per student of providing a given program at each LEA averaged across all the LEAs in the study sample without weighting. This means that each LEA contributes equally to the overall average.

Research questions

The study addressed three questions related to student outcomes and costs for Rhode Island's early college programs:

1. What effects do dual enrollment in Rhode Island public colleges, concurrent enrollment, and AP test-taking each have on high school graduates' postsecondary education outcomes, including college enrollment within one year of high school graduation, persistence to a second year of college, and initial enrollment in a four-year or two-year college?
   a. How do these effects differ for high school graduates who were academically proficient at the start of high school and those who were not?
2. What is the cost associated with dual enrollment, concurrent enrollment, and AP courses beyond the cost of a typical high school course?
3. What is the cost per outcome associated with dual enrollment in public colleges, concurrent enrollment, and AP enrollment in Rhode Island?

Box 2 summarizes the study data sources, sample, methods, and limitations, and appendix B provides additional details.

The analyses of the effects of early college programs are based on results for first-time grade 9 students in Rhode Island public schools in the 2014/15 school year who graduated on time from high school in spring 2018, the most recent cohort for which both grade 8 standardized test scores and college persistence data were available. To estimate the effect of each program on student outcomes, the study team compared high school graduates who participated in a given program with those who did not participate in any early college program. Participants were matched with nonparticipants in the same cohort based on their demographic and grade 8 academic characteristics to create similar groups.

The analyses of estimated costs leveraged primarily original data collected through practitioner interviews as well as existing program documentation. Estimated cost data were analyzed and are reported only for the 2017/18 school year. These analyses estimated the costs to serve all students enrolled that year in each program as opposed to only those who were first-time grade 9 students in the 2014/15 school year. Data sources include interviews with a sample of staff from 12 local education agencies (LEAs). Interview data are often less reliable than administrative data, especially when collected retrospectively, as in this study; however, comprehensive state data on program resources such as assigned personnel and associated materials are for the most part unavailable for the study period, necessitating the direct collection of data from program staff. The use of interview data and their limitations are addressed further in appendix B.

Box 2. Data sources, study sample, methods, and limitations

Data sources, sample information, and results are presented separately for the analysis of the effects of the three early college programs and for the analysis of program costs and cost-effectiveness.

Effects of early college programs (outcome analysis)

Data sources. The data used in the study included information on high school course enrollment and student characteristics from the Rhode Island Department of Education and postsecondary nationwide enrollment data from the National Student Clearinghouse, along with public Rhode Island college enrollment data from the Rhode Island Office of the Postsecondary Commissioner (RIOPC).

Study sample. The sample consisted of 7,015 first-time grade 9 students in Rhode Island public schools in the 2014/15 school year who graduated from high school in spring 2018. About 84 percent of Rhode Island public school students in this cohort graduated on time (National Center for Education Statistics, 2019). To isolate the effects of each early college program, students participating in more than one type of program were excluded, except for students participating in both concurrent enrollment and Advanced Placement (AP) test-taking, who constituted 36 percent of students participating in any early college program, making the combination the most common mode of participation. Less than 5 percent of students in the sample were excluded because of multiprogram participation.

Methodology. For each early college program and for high school graduates who participated in both concurrent enrollment and AP test-taking, the study team matched participating students with students in the cohort who did not participate in any early college program to create a comparison group. Comparison group members were selected so that the group had similar characteristics to the group of participating students in a given program, such as gender, race/ethnicity, and pre–high school academic achievement. Some 71–94 percent of participating students in each program were matched with nonparticipating students (see appendix B and table B3). Using these matched groups, the study team performed a series of statistical tests to estimate the effect of participating in each program on each outcome (college enrollment, college persistence, and level of initial college enrollment at a two-year or four-year institution). To determine whether the program effects differed based on academic proficiency at the start of high school, the study team also examined the effect of the programs on high school graduates who did and those who did not score at the proficient level on the state's standardized math assessment in grade 8.

Limitations. Because data on dual enrollment in private colleges were unavailable, the study could not examine the effects of this type of participation in early college programs. An estimated 7 percent of students in the cohort may have participated in dual enrollment in private colleges, and they were classified as nonparticipating students unless they also participated in dual enrollment in a public college or AP test-taking.

Some participating students were excluded from the analysis because closely matched nonparticipating students could not be identified, meaning that differences between matched and unmatched students should be kept in mind when interpreting results and considering their generalizability. For example, unmatched AP students had higher average grade 8 academic achievement than matched AP students, so the highest-achieving AP students are not as well represented in the analytic sample (see table B5 in appendix B).

Because dual enrollment was offered almost exclusively by Rhode Island's two-year public college system whereas concurrent enrollment was offered mainly through the state's two four-year public colleges, it is difficult to disentangle the effects of program type from the effects of the college type. Dual enrollment in a public college was also offered through a wider range of models than concurrent enrollment or AP, but individual students could not be linked to model type in the outcome analysis, so separate effects could not be estimated for different dual enrollment models.

In the outcome analysis, AP participation was proxied by AP test-taking rather than by AP course enrollment due to data limitations. Because data on individual students' AP course enrollment were unavailable at the state level, some students who enrolled in an AP course but did not take the test may have been misclassified as nonparticipants. Likewise, some students classified as AP participants in the analysis may have taken an AP test without enrolling in the associated course. If the students who took the tests differ from those who only enrolled in the courses, this distinction could bias the estimated effect of AP participation on student outcomes.

Costs and cost-effectiveness of early college programs (cost and cost-effectiveness analysis)

Data sources. To estimate program costs per student during the study period, the study team used primary data collected through interviews and focus groups, data from public sources, and data from RIOPC. Individual interviews or focus groups were conducted with staff from 12 local education agencies (LEAs) representing a range of geographic contexts, program enrollment sizes, and school types. Where resource quantity estimates were missing or where information about resource use during the study period was unavailable, the study team made a set of limited assumptions, most often based on class size or assumed share of resource use (see appendix B for details).

The study team used data from interviews and focus groups about each program's qualitative requirements for a given resource, such as responsibilities and qualifications for program roles. These requirements influence the price of that role on the open market. As such, the team matched these reported requirements with an appropriate associated resource for which a national market price was available through public databases (see, for example, Chang & Head, 2022). Finally, the team used the Consumer Price Index maintained by the Bureau of Labor Statistics to apply any necessary adjustments for inflation, with the aim of achieving consistency and relevance in reporting.

Interview and focus group sample. LEAs with students participating in at least one of the three early college programs during the study period were sorted into three profiles based on their geographic context—urban core, suburban, and rural—initially based on National Center for Education Statistics locale types. Grouping of profiles by LEA locale is important to ensure that the differences in program implementation and costs driven by program setting are equally represented in the sample. Rhode Island Department of Education staff helped the study team adjust the profile assignments based on their knowledge of the LEAs and how best to organize them to maximize similarity within groups and differences across groups (see appendix B). A sample of LEAs within each profile was then randomly selected to be invited for focus groups, and some LEAs with unique characteristics were purposefully selected for interviews to understand costs in their contexts. Overall, 33 of the 41 LEAs in the target population were selected, and 12 agreed to participate in the interview and focus group process, with some providing information about more than one early college program. Among the LEAs providing a given program during the study period, 11 provided information about dual enrollment costs, 7 provided information about concurrent enrollment costs, and 7 provided information about AP costs. While many students participated in both concurrent enrollment and AP during the study period, these programs were not implemented in combination consistently enough to treat this as a distinct program and integrate it into the collection of cost data (see appendix B). Interviews and focus groups included individuals with comparable roles from similar districts and were limited to 10 individuals each, using a distinct protocol appropriate to their role and context.

Student sample. To estimate costs per student, the study team included in the student sample for each early college program all students in any grade participating in that program between 2014/15 and 2017/18 in the LEAs participating in the interviews and focus groups. Unlike the sample for the outcome analysis, the sample for the cost analysis included students who did not graduate from high school and students who were not part of the cohort entering grade 9 in 2014/15. Although information about program resources was collected for 2014/15-2017/18, the estimated costs reported in this study are restricted to 2017/18 because the programs changed substantially over the study period. The period was one of both program startup and expansion. This was especially the case for dual enrollment, for which median participation in the analytic sample rose from three students in 2015/16 to nine in 2017/18. Growth in dual enrollment was particularly high early in the study period but slowed by 2017/18 to a level that more closely resembled a "steady state" stage. Estimates per student based on the low enrollments from the earlier years of the study period would likely be inflated, as some fixed costs would be spread across a much smaller group of students. The sample restriction to 2017/18 also better aligns program participation with recent program implementation (the 2022/23 school year) levels for these programs.

Methodology. To estimate the average annual cost per student for each program, the study team used cost analysis methods most closely associated with the ingredients method, which assigns a price and quantity to each resource or "ingredient" required for the program (Institute of Education Sciences, 2020). The team calculated estimated incremental costs, representing the difference in cost between each of the programs and the business-as-usual condition—a typical, comparable high school course, if applicable. These estimated costs go beyond the costs presented in program budgets or expenditure reports by including actual resource use rather than planned resource use and estimating costs for all required resources, including shared resources (for example, incremental high school counselor time) and additional staff time outside of contract hours (for example, teachers' preparing materials on the weekends or during the summer). This set of resources included all resources used to implement the programs that are or may be paid for by the state, LEAs, or schools, regardless of who bore the burden of the cost during the study period (Institute of Education Sciences, 2020). To ensure a comprehensive assessment of costs, the analysis might have included resources that were not ever or always paid for during the study period by the state but that might be if the programs were expanded (for example, the cost for students to transport themselves to and from college campuses to participate in dual enrollment). The analysis also included resources, particularly staff time, that interview and focus group participants indicated were key to program success (such as counseling time) but that current early college funding streams may not cover. Thus, in this study most estimated costs are reported as an unweighted average of LEA-level costs per student, regardless of who actually bears them. Estimated costs are also reported for the last year of the study period (2017/18) to best capture the steady state costs given the large changes in programs early in the study period, especially the growth in dual enrollment. To maintain LEA confidentiality while providing detail on variation in estimated costs, cost data are reported in a way that prevents respondent LEAs from being identified.

Using a simple ratio, the cost-effectiveness analysis combines the estimated costs with the results of the outcome analysis to explore the investment required to achieve a particular outcome. Because both the outcomes and estimated costs are reported in incremental terms, the cost-effectiveness ratio describes the additional investment associated with a particular change in outcomes, or incremental cost per incremental outcome. When different programs are evaluated using similar methods for cost and effectiveness and have the same target outcomes, comparing ratios may support decisions about investment tradeoffs.

Limitations. The sample response rate for interviewed LEAs was low, at 37.5 percent, and participating LEAs had different characteristics than those for the state overall. In general, the sample for the cost and cost-effectiveness analysis tends to reflect LEAs serving larger percentages of students of color and smaller percentages of students eligible for the National Student Lunch Program across all programs compared with LEA averages statewide (see appendix D for the full nonresponse bias analysis). In addition, there was a fair amount of variation in the estimated costs, and the combination of low response rate and high variation suggests that the estimated program costs should be interpreted as reflecting costs within the study sample and that extrapolating to the state should be done cautiously. To aid in the application of these estimates, the study team provides details on the range of estimated costs by program and LEA (where possible, given the need to maintain confidentiality) as well as suspected sources of variation, so that readers can better understand the full scope of the cost data collected and the primary drivers of variation in estimated costs.

The time between the program implementation period in 2014/15–2017/18 and the study data collection in 2023 also presents a limitation. Program staff recollections are likely to be imperfect given the time gap, staff turnover, and the need in many cases to rely on secondhand information. Specifically, participating LEA staff included a mix of individuals working during the study period and new to the LEA after the study period. In some cases some staff who were working during the study period were not in their current role. Thus, participating staff, identified by their LEA as best positioned to speak to program implementation during the study period, gathered information from a wide range of sources, including other program staff and available documentation. The variation across LEAs in available data and primary recall represents an important limitation on the cost analysis, particularly for estimates that rely on the information gathered through the interview and focus group process.

Additionally, the study team made assumptions or applied standard estimation methods to fill in data gaps for particular resources. Gaps were most common in the number of courses taken by each student in the sample, which program enrollment data did not include. The study team also applied standard estimation methods for course materials specific to each program and subject area, including, in some cases, textbooks and lab equipment that do not have an equivalent in a typical high school course, a cost that school leaders had trouble estimating. Because these estimates required assumptions, the estimated costs are particularly sensitive to the study team's choices. Appendix B details the assumptions made and indicates where it is particularly important to understand how the study team's choices affect the resulting estimates.

For the cost and cost-effectiveness analysis, costs are applicable to AP course participants and could not be estimated for test-takers only, meaning that the estimated cost per outcome refers to the cost of providing an AP course relative to the outcome associated with taking an AP test. An unknown proportion of students enrolling in an AP course may not have taken the test, and according to interviews and focus groups, some students may have taken an AP test without enrolling in the associated AP course because some schools encouraged concurrent enrollment students to also take the associated AP test in the same subject without taking a duplicative AP course. The combination of AP and concurrent enrollment was identified as a treatment group only after the study was in process, based on enrollment data not previously available to the study team. Due to limited information on the design of this combination, the team estimated two cost scenarios based on lower and upper bounds of integration between the two programs. The lower bound assumes that students experienced the programs in the same classroom setting and that all costs that are not clearly independent are entirely integrated. The upper bound assumes that the costs of the two programs are wholly independent and thus that the cost of the combination is the sum of the estimates for the two programs.

Although an unknown number of students participated in online dual enrollment, these students could not be identified for the outcome analysis, and costs could not be estimated for such courses. Based on anecdotal information from RIOPC, the number of such courses was small during the study period.

Findings

This section presents findings on the effects of each of the three early college programs on education outcomes and details the estimated cost and cost-effectiveness of each program. Because 36 percent of early college students participated in both concurrent enrollment and AP test-taking (see table A1 in appendix A), making this combination the most common form of participation in early college programs, the effect of the two programs together was also analyzed. Analyses of the three individual programs are limited to students who participated only in each program (for example, only took one or more AP tests).

Effects of early college programs

This section summarizes the findings for the effects of early college programs for recent high school graduates.

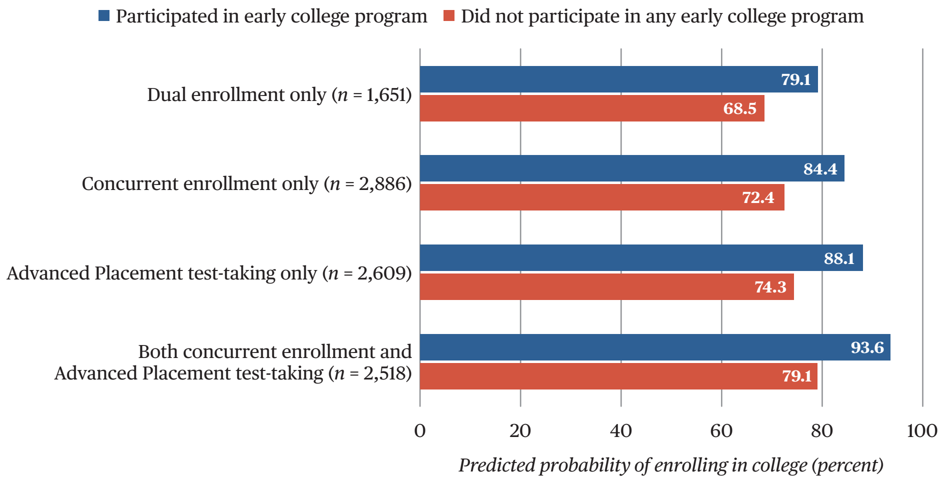
Each early college program—dual enrollment, concurrent enrollment, and Advanced Placement test-taking, along with the combination of concurrent enrollment and Advanced Placement test-taking—had a statistically significant positive effect on college enrollment within one year of high school graduation

High school graduates who took one or more dual enrollment courses had, on average, a nearly 11 percentage point higher predicted probability of enrolling in college than those who did not participate in any early college program (79.1 percent versus 68.5 percent; figure 1; see also tables C9 and C11 in appendix C). Participating in concurrent enrollment and in AP test-taking also had positive effects—predicted increases of 12 and 14 percentage points, respectively (84.4 versus 72.4 percent for concurrent enrollment and 88.1 percent versus 74.3 percent for AP). High school graduates who participated in both concurrent enrollment and AP test-taking were 15 percentage points more likely to enroll in college (93.6 percent versus 79.1 percent).

Each early college program had a statistically significant positive effect on being enrolled in college 24 months after high school graduation

The positive effect of early college programs on initial college enrollment continued in the second year of college. Among students who graduated from high school, participants in each program were, on average, more likely than nonparticipants to be enrolled in college 24 months after high school graduation. High school graduates who participated in dual enrollment had, on average, a 13 percentage point higher predicted probability of college persistence than those who did not participate in any early college program (63.9 percent versus 51.2 percent; figure 2; see also tables C9 and C11 in appendix C). High school graduates who participated in concurrent enrollment or AP test-taking also had a higher predicted probability of persistence—19 and 25 percentage points higher, respectively (69.4 percent versus 50.9 percent for concurrent enrollment and 77.0 percent versus 52.2 percent for AP). Participating in both concurrent enrollment and AP test-taking resulted in a 34 percentage point increase

Figure 1. Participants in early college programs who graduated from high school were more likely than matched nonparticipants to enroll in college within one year of high school graduation, 2014/15 grade 9 cohort

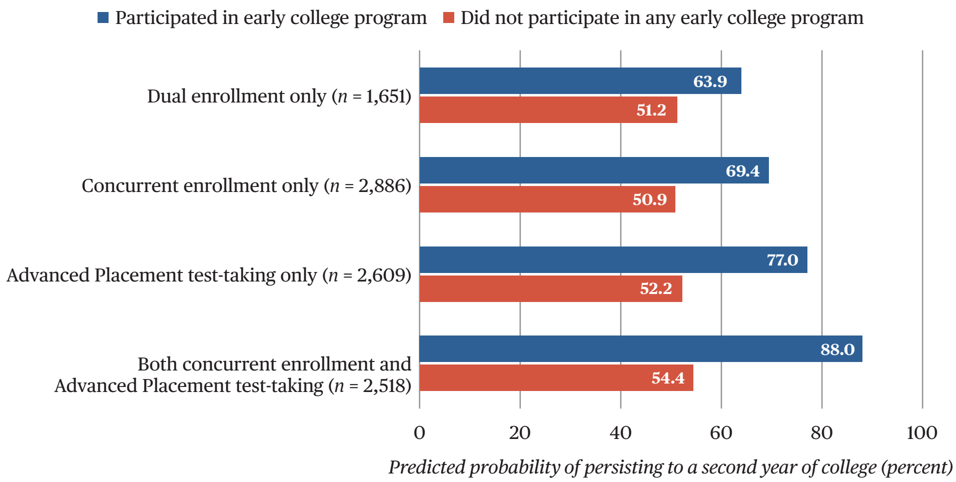


Note: Predicted probabilities are based on an analysis of matched samples, drawn from Rhode Island public school students in the fall 2014 grade 9 cohort who graduated on time from high school in the state in spring 2018, consisting of participants in each program category and similar students who did not participate in any early college program (see appendix B). Each program category was estimated to have a statistically significant effect on the probability of attaining the outcome (see tables C1, C3, C5, C7, C9, and C11 in appendix C). The parenthetical value for *n* refers to the total matched sample for a given analysis. The samples consisted of 189 participants and 1,462 comparison students for dual enrollment only, 794 participants and 2,092 comparison students for concurrent enrollment only, 969 participants and 1,640 comparison students for AP test-taking only, and 1,021 participants and 1,497 comparison students for the combination of concurrent enrollment and AP test-taking.

Source: Authors' analysis of data from the Rhode Island Department of Education.

Figure 2. Participants in early college programs who graduated from high school were more likely than matched nonparticipants to be enrolled in college 24 months after high school graduation, 2014/15 grade 9 cohort

Predicted probability of persisting to a second year of college (percent)



Note: Predicted probabilities are based on an analysis of matched samples, drawn from Rhode Island public school students in the fall 2014 grade 9 cohort who graduated on time from high school in the state in spring 2018, consisting of participants in each program category and similar students who did not participate in any early college program (see appendix B). Each program category was estimated to have a statistically significant effect on the probability of attaining the outcome (see tables C1, C3, C5, C7, C9, and C11 in appendix C). The parenthetical value for *n* refers to the total matched sample for a given analysis. The samples consisted of 189 participants and 1,462 comparison students for dual enrollment only, 794 participants and 2,092 comparison students for concurrent enrollment only, 969 participants and 1,640 comparison students for AP test-taking only, and 1,021 participants and 1,497 comparison students for the combination of concurrent enrollment and AP test-taking.

Source: Authors' analysis of data from the Rhode Island Department of Education.

in the predicted probability of college persistence (88.0 percent versus 54.4 percent). These estimates represent the probability of college persistence combined with the effect on enrolling in college in the first place.

The positive effects of early college programs on college enrollment appear to be driven largely by increases in four-year rather than two-year college enrollment

In addition to helping some high school graduates who would not have enrolled in college at all, early college programs may have diverted students who would have enrolled in a two-year college to a four-year college instead. For each program category, participants in early college programs had a lower predicted probability of enrolling in a two-year college than nonparticipants (although for dual enrollment participants, the difference was not statistically significant; figure 3; see also tables C2, C4, C6, C8, C10, and C13 in appendix C). However, participants in each program had a higher predicted probability of enrolling in a four-year institution than nonparticipants.

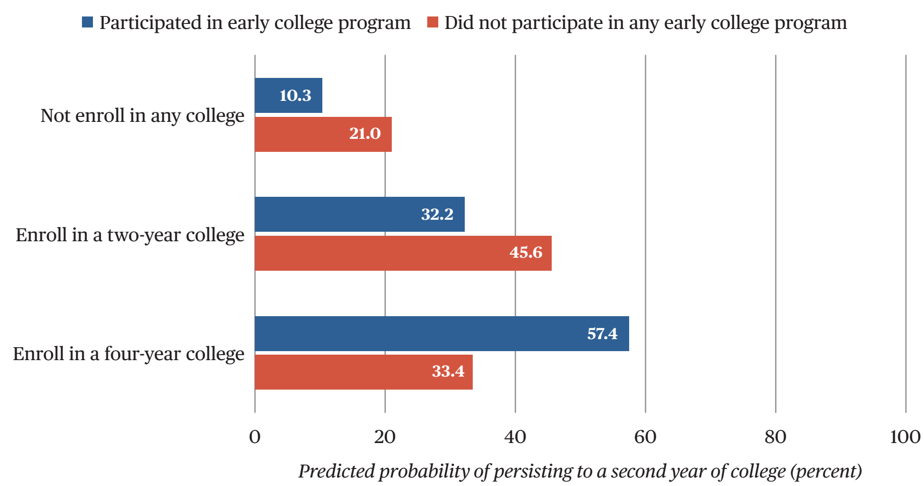
The positive effects of concurrent enrollment and Advanced Placement test-taking extended to high school graduates who did not score at an academically proficient level in math in grade 8

The effects of concurrent enrollment, AP test-taking, and the combination of concurrent enrollment and AP test-taking were positive for high school graduates regardless of whether they scored at the proficient level or higher on the state's grade 8 standardized math assessment. This pattern held for both initial college enrollment and college persistence (see tables C12 and C14 in appendix C). Although nonproficient dual enrollment students were predicted to enroll in college and persist at a higher rate than nonparticipating nonproficient students, the difference was not statistically significant for either outcome. These effects are similar when comparing students by proficiency on the grade 8 reading assessment (see tables C15–C22). However, for dual enrollment students who were nonproficient in reading, the difference in the predicted probability of attaining each outcome compared with nonparticipating nonproficient students was close to zero and not statistically significant.

In the period analyzed, dual enrollment programs reached a small number of students statewide (*n* = 211) and were offered primarily to limited numbers of students at a few urban comprehensive high schools and through

Figure 3. Participants in concurrent enrollment who graduated from high school were more likely than matched nonparticipants to enroll in a four-year college but less likely to enroll in a two-year college or no college within a year of high school graduation, 2014/15 grade 9 cohort

Predicted probability of attaining the outcome (percent)



Note: *n* = 2,864. Predicted probabilities are based on an analysis of a matched sample, drawn from Rhode Island public school students in the fall 2014 grade 9 cohort who graduated on time from high school in the state in spring 2018, consisting of participants in concurrent enrollment and similar students who did not participate in any early college program (see appendix B). Data on level of initial college enrollment were missing for 22 of those students. The sample consisted of 792 participants and 2,072 comparison students.

Source: Authors' analysis of data from the Rhode Island Department of Education.

more specialized, comprehensive college-access programs with a disproportionate number of students from populations that have been less likely to enroll in college. If the dual enrollment program were more widely scaled to other student populations and settings, effects could differ. The small sample size also meant that it was difficult to detect and estimate effects precisely, particularly for the small group of nonproficient dual enrollment students (*n* = 87; see tables C1 and C2 in appendix C).

Estimated costs of early college programs

This section summarizes the findings on the cost of early college programs.

The estimated average annual incremental cost per student to provide each early college program in 2017/18 varied widely across programs—from $900 to $6,400—and within programs

The estimated average annual incremental cost per student in 2017/18 was $900 for AP, $1,600 for concurrent enrollment, and $6,400 for dual enrollment (table 1). But the estimated cost varied widely across LEAs within each program. Across LEAs the estimated cost ranged from $800 to $1,100 for AP, from $1,100 to $2,800 for concurrent enrollment, and from $3,000 to $10,900 for dual enrollment (figure 4).[4]

Although dual enrollment had the highest estimated average annual incremental cost per student, it had the lowest estimated total cost because of the small number of students served. The median total cost per LEA in 2017/18 was $164,300 for AP, $147,400 for concurrent enrollment, and $41,900 for dual enrollment (see table C24 in appendix C).

There are systematic differences in the number and type of students each program serves. Most notably, in each LEA, dual enrollment generally served fewer participants (in some cases fewer than five) and a higher proportion of students eligible for the National School Lunch Program, students of color, students with an

Table 1. Estimated annual incremental cost per student, by early college program, 2017/18 (dollars)

Measure	Advanced Placement (*n* = 7 LEAs)	Concurrent enrollment (*n* = 7 LEAs)	Dual enrollment (*n* = 10 LEAs)
Average	900	1,600	6,400
Median	900	1,300	5,400
Standard deviation	100	700	2,900
Minimum	800	1,100	3,000
Maximum	1,100	2,800	10,900

LEA is local education agency.

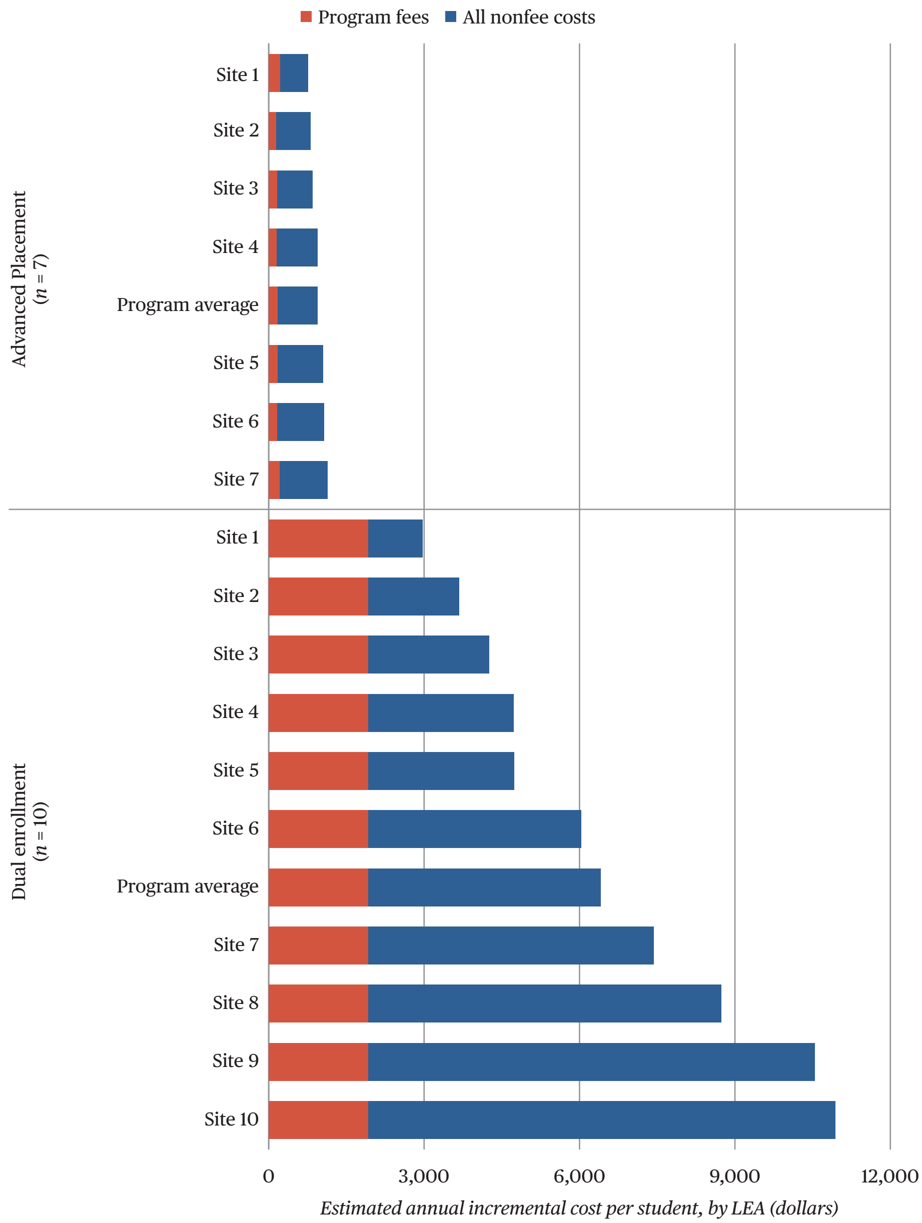
Note: Estimated costs are based on incremental estimates per student at the LEA level, rounded to the nearest $100, reported in 2022 constant dollars, and discounted for present value at a rate of 3 percent. Estimates that were two standard deviations above or below the average for a program were considered outliers and are excluded from the reported estimates. This resulted in the removal of one LEA's estimates for one program.

Source: Authors' analysis of LEA interview and focus group data, public price datasets, and enrollment and fee data from the Rhode Island Office of the Postsecondary Commissioner.

4. Figure 4 presents estimated cost per student by site for Advanced Placement and dual enrollment. At the time of publication, IES did not have the data to complete figure 4 for concurrent enrollment. Cost estimation typically relies on a combination of primary sources of information about program costs and the recollections of program staff about the underlying use of program resources. The resulting estimated costs therefore depend on a set of reasonable assumptions and estimation procedures that are imprecise in nature. For this study, which attempted to reconstruct costs for programs implemented several years before the time of data collection, available primary documentation on program costs was limited. The key exception to this is costs resulting from program fees. Aside from the fees, the study team had to rely on program staff's recollections to fill gaps in documentation, an inherently less precise data source. To reflect this imprecision, all reported costs are approximate and have been rounded to the nearest $100. Because the estimated costs required assumptions when available data were imprecise, the study team also estimated high and low likely values for each estimate to represent this uncertainty. Even when the uncertainty in estimation is taken into account, the estimated average annual cost per student remained highest for dual enrollment, followed by concurrent enrollment and then AP (see figure C5 in appendix C).

Figure 4. The estimated cost per student for each early college program varied across local education agencies (LEAs), especially for dual enrollment, 2017/18

Estimated annual incremental cost per student, by LEA (dollars)



Note: Estimated costs are unweighted averages of estimates per student at the LEA level, rounded to the nearest $100, reported in 2022 constant dollars, and discounted for present value at a rate of 3 percent. Estimates that were two standard deviations above or below the mean for a program were considered outliers and are excluded from the reported estimates. This resulted in the removal of one LEA's estimates for one program.

Source: Authors' analysis of LEA interview and focus group data, public price datasets, and enrollment and fee data from the Rhode Island Office of the Postsecondary Commissioner.

Individualized Education Program (IEP), and chronically absent students than the other two programs (see table B1 in appendix B). Smaller programs typically have higher costs per student because of economies of scale (Andrews et al., 2002), and programs serving student populations that may have greater needs, such as students with an IEP or chronically absent students, may entail higher costs to meet those needs (Hooker et al., 2021). Additionally, the estimated costs of dual enrollment include fees and tuition paid for through state funding. The fees were higher when compared with the other two programs, a key contributing factor to the estimated cost of dual enrollment (see figure 4). These differences may help explain the higher estimated cost for dual enrollment and should be kept in mind when comparing programs. These issues are discussed further in the *Key drivers of variation in the cost of early college programs* section in appendix C.

Each early college program entails additional estimated staff time beyond the time required by business-as-usual courses as well as estimated costs for postsecondary fees or AP testing fees, and equipment and materials

The cost analysis identified the incremental resource use supporting each program in four broad categories: personnel, equipment and materials, transportation, and other resources.

In most cases personnel was the largest resource category for the three programs. Practitioners noted additional personnel time required to implement each program, including administration and coordination activities and typically direct student support from high school counselors (see appendix C for details on staff time). The median estimated incremental cost per student of this time was $500 for concurrent enrollment, $700 for dual enrollment, and $800 for AP.[5]

Estimated costs of equipment and materials for concurrent enrollment and dual enrollment were similar and were lower than those for AP.[6] Because a central feature of dual enrollment is that students attend class on a college campus, estimated costs of transportation apply only to dual enrollment and were typically not paid for with public funds in 2017/18 but were instead borne by participating students and their families.[7]

All three programs had estimated costs in the "other resources" category, reflecting primarily tuition and fees.[8] For dual enrollment these tuition and fees, based on data maintained by the RIOPC, were $1,900 per student, which exceeds the total average estimated costs for each of the other programs (see appendix B for additional information on these estimates).

The estimated costs for concurrent enrollment do not include the substantial costs associated with meeting the required qualifications for program instructors. Concurrent enrollment instructors generally must have a master's degree in the subject or content area of the course, although specific requirements vary by college and course. If an LEA does not already have a supply of instructors with such qualifications, the costs for instructors to meet this requirement—for example, graduate course tuition, fees, and materials associated with the required degree—are substantial. In addition, the costs could include the compensation the instructor would forgo while taking time out of the workforce to pursue the degree.

Offering concurrent enrollment and AP as a single course, as opposed to separately, may reduce their overall costs

The estimated cost per student for the combination of concurrent enrollment and AP differed depending on the degree to which the two programs, and students' individual experiences of the programs, were separate or integrated. Although interview and focus group participants indicated that course integration occurred in some schools, complete information on whether concurrent enrollment and AP courses were co-listed in all LEAs was unavailable.

---

5. Estimated personnel costs reported here may not be entirely directly accounted for in official LEA financial reporting because staff may be conducting these program activities outside of contract hours (including on the weekends and in the summer) or making time for them by displacing other, unrelated job responsibilities. As is the standard practice in cost analysis, program personnel time over and above business as usual is assumed to have an opportunity cost and therefore falls within the scope of this analysis.
6. These costs were estimated based on a combination of documentation about courses offered during the study period, information gathered in the interviews and focus groups, and a program-specific set of estimation business rules applied consistently to all LEAs for a given early college program. For more information, see appendix B.
7. These costs were estimated based on a set of business rules applied to all LEAs in the dual enrollment sample and public data about the cost of transportation. Like the K-12 personnel estimates, these costs would not be reflected on an expenditure report for the dual enrollment program, but the interview and focus group participants identified transportation as a key factor driving access to dual enrollment, and it is standard cost analysis practice to include all costs necessary for the program (Cost Analysis Standards Project, 2021).
8. This is the only specific cost for which administrative data were available and were the sole data source for estimation. For AP, fees refer to the fee paid per test. For concurrent enrollment and dual enrollment, fees reflect the average tuition and fees per student paid to partner postsecondary institutions. These fees were typically paid through state funds, and in most cases in 2017/18, they required no specific allocation of LEA funds.

If the two programs were implemented entirely separately (students take concurrent enrollment and AP courses separately in different subjects), the costs would be the sum of the cost of each program on its own, and the average cost per student of the combination could be as high as $2,500 ($900 plus $1,600; table 2). However, if the two programs were implemented in an integrated way, with costs aside from program fees combined in a way that maximizes efficiency (that is, as a single course), the estimated average cost per student could be closer to $900 (the cost for AP alone). While in practice the degree of program integration likely varies and falls somewhere between these extremes, these high- and low-end estimates show the considerable potential for cost savings by integrating these programs. More reliable information about what the combined implementation of these programs typically entails would be necessary to precisely describe the resources and costs associated with an integrated program model.

Across the three early college programs the cost per student tended to decline as program participation increased, providing suggestive evidence of economies of scale

Across programs the estimated average cost per student varied systematically with the number of participants, or program scale. Specifically, the cost per student declined as program scale increased, with a large drop in average cost in the third quintile of program enrollment or higher. This aligns with a general pattern observed in education costs: as scale increases, unit costs decline and gradually level out (Andrews et al., 2002). These

Table 2. Estimated incremental cost per student, by early college program and resource category, 2017/18 (dollars)

Program and measure	Personnel	Equipment and materials	Transportation	Other resources	Total
Advanced Placement (*n* = 7 LEAs)					
Average	700	100	na	200	900
Median	800	100	na	200	900
Standard deviation	200	< 100	na	< 100	100
Minimum	500	< 100	na	100	800
Maximum	800	100	na	200	1,100
Concurrent enrollment (*n* = 7 LEAs)					
Average	700	600	na	300	1,600
Median	500	500	na	300	1,300
Standard deviation	600	200	na	< 100	700
Minimum	300	400	na	300	1,100
Maximum	1,800	900	na	300	2,800
Dual enrollment (*n* = 10 LEAs)					
Average	2,400	1,100	1,000	1,900	6,400
Median	700	900	800	1,900	5,400
Standard deviation	2,800	700	700	< 100	2,900
Minimum	100	400	600	1,900	3,000
Maximum	7,200	2,700	2,900	1,900	10,900

LEA is local education agency. na is not applicable.

Note: Estimated costs are based on incremental estimates per student at the LEA level, rounded to the nearest $100, reported in 2022 constant dollars, and discounted for present value at a rate of 3 percent. Average costs by resource category may not sum to the total because of rounding. Estimates that were two standard deviations above or below the average for a program were considered outliers and are excluded from the reported estimates. This resulted in the removal of one LEA's estimates for one program.

Source: Authors' analysis of LEA interview and focus group data, public price datasets, and enrollment and fee data from the Rhode Island Office of the Postsecondary Commissioner.

results are found across all three programs, and scale varies systematically by program across the study sample during the study period (see figure C4 in appendix C).[9]

Cost-effectiveness of early college programs

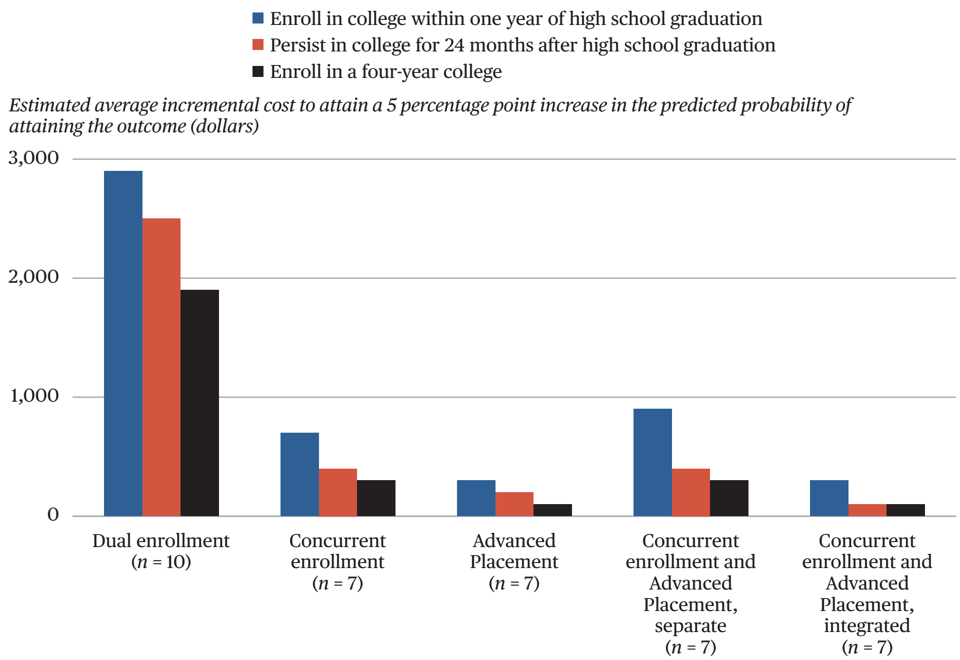
Cost-effectiveness varied across the early college programs with respect to college entry and persistence

To assess the relative efficiency of each early college program, the study team compared average costs with the estimated effect. For each program the results reflect the estimated cost per student associated with an average increase in the probability of attaining key postsecondary outcomes.

On average, AP required an estimated investment of $100-$300 per student to realize a 5 percentage point increase in the predicted probability of success across outcomes (figure 5; see also table C23 in appendix C).[10] The

Figure 5. Advanced Placement (AP) was more cost-effective than concurrent enrollment and dual enrollment programs, 2017/18

Estimated average incremental cost to attain a 5 percentage point increase in the predicted probability of attaining the outcome (dollars)



Note: For outcome estimates the sample size for enrollment within one year and persistence is 1,651 for dual enrollment, 2,886 for concurrent enrollment, 2,609 for AP, and 2,518 for the combination of concurrent enrollment and AP. For enrollment in a four-year college the sample size is 904 for dual enrollment, 1,663 for concurrent enrollment, 1,645 for AP, and 1,699 for the combination of concurrent enrollment and AP. For estimated costs the sample size is 11 local education agencies (LEAs). Estimated costs are unweighted averages of estimates per student at the LEA level, rounded to the nearest $100, reported in 2022 constant dollars, and discounted for present value at a rate of 3 percent. Estimates that were two standard deviations above or below the mean for a program were considered outliers and are excluded from the reported estimates. This resulted in the removal of one LEA's estimates in one program.

Source: Authors' analysis of data from Rhode Island Department of Education and cost calculations based on data from LEA interviews and focus groups, public price datasets, and enrollment and fee data from the Rhode Island Office of the Postsecondary Commissioner.

9. In the study sample the smallest program sizes are in dual enrollment, and the largest are in AP. This pattern is observed in the overall population of LEAs providing these three programs during the study period. More balanced variation in program scale within each program would be needed to understand trends for each program separately.

10. Although costs are estimated on the basis of providing a program for a single year, outcomes were recorded over the course of a student's high school years, and the estimated impacts are based on some students' experiencing multiple years of early college programs. Exploratory estimation of costs that takes into account providing multiple years of the program per student suggests that dual enrollment still has the highest cost per outcome. However, more than half of AP students participate in multiple years, compared with less than half of dual enrollment and concurrent enrollment students, so the cost per outcome for AP in this estimation is close to that of concurrent enrollment (see table D4 in appendix D).

cost-effectiveness of concurrent enrollment was comparable to that of AP, requiring an estimated investment of $300–$700 per student to achieve the same increase. The same increase in the probability of success across outcomes through dual enrollment required an estimated investment of $1,900–$2,900 per student, depending on the outcome. Finally, the combination of concurrent enrollment and AP was estimated to achieve the same increases for an investment of $100–$900 per student, depending on the outcome and how the combination was implemented.

For additional detail and sensitivity analyses from the cost and cost-effectiveness analyses, see tables C25–31 and figures C2, C3, and C5 in appendix C.

Implications

This study provides evidence that Rhode Island's early college programs are putting students on a path to college success. Each program demonstrated positive effects on college enrollment and persistence. In addition, each program had a positive effect on the probability of starting at a four-year college, and participants in concurrent enrollment and AP test-taking were less likely than nonparticipants to enroll in a two-year college. This latter finding suggests that in addition to helping some students who would not have enrolled in college at all, early college programs may have diverted students who would have gone to a two-year college to a four-year college. Given that students who start at a four-year college have a better chance of completing a degree (Ross et al., 2012), this effect may be positive for the state.

The study also finds that the effects of concurrent enrollment and AP test-taking are not limited to students who were academically proficient when they started high school. The positive outcomes for college persistence among previously nonproficient students suggest that these programs prepare those students for the rigor of a college academic experience. This finding aligns with prior research in Rhode Island that suggests that early college programs are associated with a lower probability of placement in postsecondary developmental (or "remedial") education (Shields et al., 2021). Given this evidence, policymakers might consider expanding early college access to a wide range of students, with appropriate supports.

The study finds additional information about the estimated cost and cost-effectiveness of the three early college programs that state policymakers can consider as they target limited resources to achieve the greatest student impact. When estimated program costs and estimates of program effectiveness were combined, participation in AP yielded somewhat larger effects on college persistence at a lower cost than participation in dual enrollment or concurrent enrollment. The size of the effect on college enrollment was similar across the three programs, and the least expensive program studied, AP, provided this effect at the lowest estimated cost.

While concurrent enrollment yielded the same outcomes at only marginally higher estimated costs than AP, the estimated costs of concurrent enrollment do not include the costs associated with meeting the qualification requirements for the program's instructional staff in schools where staff do not already meet them. Based on the interviews and focus groups, the staff qualification requirements present a substantial barrier to expanding concurrent enrollment. Paying teachers to earn the needed credential—a master's degree in their course content area—would introduce a large new cost for districts or the state, and recruiting additional teachers who already have these credentials presents its own challenges.[11] Thus, large-scale expansion of concurrent enrollment would likely require a change in teacher qualification requirements or a shift in the supply of teachers already meeting these requirements in Rhode Island.

Although the estimated cost-effectiveness of dual enrollment is lower than that of the other two programs, a larger proportion of the students in the program were from populations that have been less likely to enroll

11. In the 2020/21 school year median tuition for graduate school over three years at public institutions was roughly $35,000, a considerable investment per teacher (Integrated Postsecondary Education Data System, 2022) Moreover, to incentivize teachers to pursue this additional schooling, their forgone earnings would need to be accounted for as well. Given that the average annual compensation for a teacher in Rhode Island in 2019, including base salary and estimated benefits, was roughly $122,000, pursuing an additional graduate credential likely amounts to a major additional investment per teacher over a three-year period (Bureau of Labor Statistics, 2019).

in college, and the program's effects were positive. Thus, the program offers a potential lever for the state to help such students succeed in college and meet its goal of closing gaps in college completion. The estimated costs may reflect the higher investment required to support these students rather than the typical cost of providing dual enrollment to the average student. For example, some schools offered dual enrollment within a "high-touch" college preparation model that provided intensive advising and other resources to ensure student success. Moreover, the estimated costs of dual enrollment in this study are comparable to those found in one of the few similar cost-effectiveness studies available, which evaluated the comprehensive P-TECH model in New York City schools (Rosen et al., 2023; see appendix A). Finally, although examining the societal benefits of improving outcomes for historically underserved populations is beyond this study's scope, there are certainly societal benefits associated with improving those outcomes, including the long-term impacts of postsecondary education persistence and achievement (Atchison et al., 2019).

The state might benefit from conducting further research on the dual enrollment program as it matures, takes on different models, and extends to different populations. As a relatively new program in the state, dual enrollment at the time of this study varied widely in implementation across LEAs, but over time it might become more consistent as schools and colleges try out and modify different approaches, like longer-established programs such as AP. This process could also help determine whether a less costly, "low-touch" model could replicate the same success with historically underserved students in urban high schools and what specific resources are important to meeting the needs of that population.

Although the cost and cost-effectiveness findings clearly show that incremental costs per student are higher for dual enrollment than for the other programs, while producing similar outcomes, policymakers might consider a broader set of contextual factors and priorities when using this evidence to inform decisions about future investment. Decisionmakers might note that the higher estimated cost per student of dual enrollment is likely due in part to its lower enrollment and the effect of economies of scale. However, by the same token, it is less costly overall than the other programs. Finally, dual enrollment's success in reaching historically underserved students effectively might justify its higher costs.

Further research might be useful on the costs and potential efficiencies of offering courses that students can use for both concurrent enrollment credit and AP test-taking. Interviews with LEA staff suggest that some students took the AP test corresponding to the subject area of their concurrent enrollment course without enrolling in an additional AP course. There are still costs associated with this add-on approach, including test fees and potentially additional counselor time for registration and other activities, so educators and administrators should be wary of advocating for this as a cost-neutral route to boosting college credit in high school.

Finally, an important consideration with respect to the cost-effectiveness results is the possibility of reducing the cost for participating students to complete postsecondary education. A student who secures transferable course credit or is able to skip entry-level coursework in college might avoid the cost of several courses. From the perspective of families, state support for early college programs could meaningfully reduce their college costs, but only under the assumption that the student takes the same number of courses across their postsecondary career, regardless of early college program participation.[12] From the perspective of the state, the net effect on postsecondary costs is more complicated. Given this study's finding that participants are more likely to enroll and persist in college than nonparticipants, the programs might result in a net increase in postsecondary education and associated costs for the state because of students who would otherwise not have attended or stayed in college. Although a net increase in postsecondary education consumption would entail additional costs for the state, from a societal perspective these costs could return numerous benefits that are beyond the scope of this study to assess. A full assessment of the balance of the monetary costs and benefits of these programs, which was beyond the scope of this study, is worthy of consideration by the state.

12. However, research suggests that earning college credits in high school does not necessarily translate into a shorter time in postsecondary education (see appendix A).

References

An, B. P. (2013). The impact of dual enrollment on college degree attainment: Do low-SES students benefit? *Educational Evaluation and Policy Analysis, 35*(1), 57-75. https://doi.org/10.3102/0162373712461933

Andrews, M., Duncombe, W., & Yinger, J. (2002). Revisiting economies of size in American education: Are we any closer to a consensus? *Economics of Education Review, 21*(3), 245-262. https://doi.org/10.1016/S0272-7757(01)00006-1

Atchison, D., Zeiser, K. L., Mohammed, S., Knight, D. S., & Levin, J. (2019). The costs and benefits of early college high schools. *Education Finance and Policy, 16*(4), 1-56. https://doi.org/10.1162/edfp_a_00310

Bureau of Labor Statistics. (2019). *Occupational Employment Statistics (OES) May 2019 State Occupational Employment and Wage Estimates–Rhode Island* [Data set]. Retrieved from https://www.bls.gov/oes/2019/may/oes_ri.htm#25-0000

Chang, Y., & Head, L. (2022). *Database of National Prices of Educational Resources*. CAP Project. https://capproject.org/s/Database-of-Prices_04272022-llz5.xlsx

Cost Analysis Standards Project. (2021). *Standards for the economic evaluation of educational and social programs*. American Institutes for Research. https://www.air.org/sites/default/files/Standards-for-the-Economic-Evaluation-of-Educational-and-Social-Programs-CASP-May-2021.pdf

Edmunds, J. A., Lewis, K., Hutchins, B., & Klopfenstein, K. (2018). *Transforming comprehensive high schools into early colleges: The impacts of the Early College Expansion Partnership*. SERVE Center, University of North Carolina at Greensboro.

Edwards, L., Hughes, K. L., & Weisberg, A. (2011). *Different approaches to dual enrollment: Understanding program features and their implications*. The James Irvine Foundation. https://ccrc.tc.columbia.edu/media/k2/attachments/dual-enrollment-program-features-implications.pdf

Fink, J., & Jenkins, D. (2023). *Rethinking dual enrollment as an equitable on-ramp to a career-path college degree program after high school*. Community College Research Center. Retrieved February 7, 2024, from https://ccrc.tc.columbia.edu/publications/revamping-dual-enrollment-equitable-college-degree-paths.html

Giani, M., Alexander, C., & Reyes, P. (2014). Exploring variation in the impact of dual-credit coursework on postsecondary outcomes: A quasi-experimental analysis of Texas students. *High School Journal, 97*, 200-218. https://eric.ed.gov/?id=EJ1026262

Haxton, C., Song, M., Zeiser, K., Berger, A., Turk-Bicakci, L., Garet, M. S., Knudson, J., & Hoshen, G. (2016). Longitudinal findings from the early college high school initiative impact study. *Educational Evaluation and Policy Analysis, 38*(2), 410-430.

Hooker, S., Niño, D., Finn, S., & Rice, A. (2021). Dual enrollment for students from special populations: Improving college transitions for English learners, students with disabilities, foster youth, and young people experiencing homelessness. Jobs for the Future. Retrieved February 7, 2024, from https://www.jff.org/idea/dual-enrollment-students-special-populations/

Institute of Education Sciences. (2020). *Cost analysis: A starter kit. Version 1.0.* (IES 2020-001). U.S. Department of Education. Institute of Education Sciences. https://eric.ed.gov/?id=ED604237

Integrated Postsecondary Education Data System. (2022). Fall Enrollment Survey (IPEDS-EF:89-99), Completions Survey (IPEDS-C:90-99), and Institutional Characteristics Survey (IPEDS-IC:89-99); IPEDS Fall 2000 through Fall 2020, Institutional Characteristics component; and IPEDS Spring 2001 through Spring 2021, Fall Enrollment component. U.S. Department of Education, National Center for Education Statistics. Retrieved September 21, 2023, from https://nces.ed.gov/programs/digest/d21/tables/dt21_330.50.asp

National Center for Education Statistics. (2019). Common Core of Data: Public high school 4-year adjusted cohort graduation rate (ACGR), by race/ethnicity and selected demographic characteristics for the United States, the 50 states, the District of Columbia, and Puerto Rico: School year 2017-18. National Center for Education Statistics. Retrieved May 6, 2024, from https://nces.ed.gov/ccd/tables/ACGR_RE_and_characteristics_2017-18.asp

New England Secondary School Consortium. (2023). Common Data Project 2023 annual report 2023. Retrieved April 24, 2024, from https://www.greatschoolspartnership.org/data-report/

PrepareRI. (2018). PrepareRI [Brochure]. https://static1.squarespace.com/static/59a81489579fb39e3ef2232f/t/5a1c8781652dea2e1aa36624/1511819138623 PrepareRI+Brochure+for+Web.pdf

Rhode Island Department of Education. (2023). PrepareRI dashboard. Retrieved May 13, 2024, from https://datacenter.ride.ri.gov/Home/FileDetail?fileid=997

Rhode Island Department of Education. (n.d.). *Earning college credit in high school: Opportunities for RI students*. [Memo]. Retrieved February 7, 2024, from https://ride.ri.gov/sites/g/files/xkgbur806/files/2023-05/RIDE_Advanced_Coursework_Guide.docx?ver=2021-03-02-121453-927

Rhode Island General Laws § 16-100-3 (2013).

Rosen, R., Alterman, E., Treskon, L., Parise, L., Dixon, M., & Wuest, C. (2023, October). P-TECH 9-14 pathways to success: Implementation, impact, and cost findings from the New York City P-TECH 9-14 schools evaluation. MDRC. https://www.mdrc.org/sites/default/files/P-TECH_Final_Report.pdf

Ross, T., Kena, G., Rathbun, A., Kewal Ramani, A., Zhang, J., Kristapovich, P., & Manning, E. (2012, August). *Higher education: Gaps in access and persistence study* (NCES 2012-046). U.S. Department of Education, National Center for Education Statistics. Government Printing Office.

Shields, K. A., Bailey, J., Hanita, M., & Zhang, X. (2021). *The effects of accelerated college credit programs on educational attainment in Rhode Island* (REL 2021-103). U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Northeast & Islands. https://eric.ed.gov/?id=ED612887

Struhl, B., & Vargas, J. (2012). *Taking college courses in high school: A strategy guide for college readiness: The college outcomes of dual enrollment in Texas*. Jobs for the Future. http://eric.ed.gov/?id=ED537253

Author contributions

K. Shields and A. Jacobson conceptualized the research and, with the help of M. Hanita, designed the research plan. J. Aubele performed data cleaning, conducted analyses, and created figures and tables for the outcome analysis findings. L. Hadley and A. Jacobson conducted cost focus group interviews. L. Hadley and A. Jacobson performed analyses and created figures and tables for the cost and cost-effectiveness findings. K. Shields, A. Jacobson, L. Hadley, and J. Aubele wrote the initial manuscript, with M. Hanita contributing. All authors reviewed the final report.

Acknowledgments

Data for this report were obtained with the assistance of the Rhode Island Longitudinal System (RILDS Center). The views expressed here are those of the authors and do not necessarily represent those of the State of Rhode Island, the RILDS Center, or RIDE. Any errors are attributable to the authors. The authors would like to thank Eric Hedberg for his advice on the coarsened exact matching approach and Fiona Hollands for her advice on the cost-effectiveness approach.