ANALYSIS NARRATIVE | MAY 2024

Education to Workforce Pathways Diagnostic Toolkit

Analytic code and guidance for using state longitudinal data to understand K12 student progression into postsecondary and the workforce.

ACKNOWLEDGEMENT

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ABOUT THE STRATEGIC DATA PROJECT

SDP partners with state and local K–12 education agencies to build capacity for managing, analyzing, and communicating with data. SDP cultivates analytic talent through a two-year fellowship program, in-person and online trainings, and widely accessible tools and resources. The Harvard Center for Education Policy Research launched SDP in 2008 to meet a need for analytical capacity in state and local K–12 agencies. Reform-minded school superintendents were experimenting with new programs and policies, but lacked the capacity to evaluate those efforts or to make data-informed decisions.

Since 2008, SDP has collaborated with nearly 300 school districts, charter management organizations, state education agencies, and nonprofits to sponsor close to 600 SDP Fellows. Fellows may already work at a partner agency, or SDP recruits and selects Fellows who are then placed at partner organizations. SDP alumni work at K–12 agencies and organizations around the country, and most alumni continue to take advantage of the SDP professional network, trainings, and analytical resources.

The SDP Pathways diagnostic was prepared with support from the Bill and Melinda Gates Foundation.

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INTRODUCTION

By 2031, 72 percent of jobs in the United States will require some form of postsecondary education.†

Given the demand for college-educated workers, it is crucial for state education leaders to address the gap between the current number of qualified young adults and anticipated workforce needs. To ensure local economic vitality, expand access to higher education, and promote individual economic mobility, education leaders and state policymakers need local, actionable data illustrating students' journeys from pre-K through the workforce and the barriers they encounter along the way.

Newly modernized longitudinal data systems allow analysts within state and local education agencies to unlock these insights and uncover critical intervention points to promote student success and advance policy goals around credential completion and meaningful economic opportunities.

To this end, the Strategic Data Project designed a toolkit that leverages longitudinal education data to:

1. **Analyze college enrollment, completion, and workforce outcomes of students within a state**
2. **Identify potential areas of action to improve students' postsecondary attainment and financial stability.**

† Anthony P. Carnevale, Nicole Smith, Martin Van Der Werf, and Michael C. Quinn. After Everything: Projections of Jobs, Education, and Training Requirements through 2031. Washington, DC: Georgetown University Center on Education and the Workforce, 2023. cew.georgetown.edu/Projections2031.

SDP EDUCATION AND WORKFORCE DIAGNOSTIC

Overview of Diagnostic

The Strategic Data Project Education to Workforce Pathways Diagnostic Toolkit **("SDP Pathways Diagnostic")** is a collection of analyses that can help education leaders better understand patterns in student college enrollment, attainment, and earnings, and make strategic decisions about how to help all students succeed.

Clearly understanding the current status quo within a state is a prerequisite for designing strategies for improvement, as leaders need accurate, local, and timely information about the ways in which current systems are supporting—and could better support—student success.

Additionally, this Diagnostic demonstrates more broadly how education agencies can capitalize on their state longitudinal data systems to inform decision making.

This Diagnostic includes analyses that answer the following question: **What are the education and workforce outcomes for high school graduates in a state?**

- *Section 1: Patterns in Educational Attainment* examines postsecondary degree completion 10 years from high school graduation to establish a foundational understanding of students' postsecondary educational outcomes.

- *Section 2: K-12 to College Enrollment* analyzes patterns in college enrollment within one year of high school graduation to unearth the drivers of credential completion rates in a state. This section focuses on enrollment within one year, when secondary schools and districts have the most leverage to impact college-going.

- *Section 3: College Completion and Stop Out* tracks college completion among high school graduates with a particular emphasis on enrollment behaviors and composition of college stop outs. These analyses further unpack potential drivers of degree attainment rates.

- *Section 4: Earning a Living Wage* presents wages for high school graduates across educational attainment and student background characteristics, such as student poverty and prior achievement. We provide context to these analyses by benchmarking earnings against living wage thresholds to better understand who is earning enough to meet their basic needs.

The outcomes we explore in this Diagnostic, as well as many of the disaggregates, are informed

WHAT ARE STATE LONGITUDAL EDUCATION DATA?

State longitudinal education data (SLEDS or P20W) are comprehensive data systems maintained by state education agencies to collect, store, and analyze educational data longitudinally, spanning from early childhood through K-12 education and into post-secondary education and workforce participation.

by the **Education-to-Workforce (EW) Indicator Framework**—a comprehensive guide that provides a common set of metrics and data equity principles for assessing and addressing disparities along the pre-K-to-workforce continuum (44).

The appendix includes two tables mapping primary outcomes and disaggregates to the EW Framework indicators. These tables also include readings that provide context to the analyses presented in this Diagnostic.

For each section of the Diagnostic, this narrative document provides a framework for exploration, including additional research, guiding questions, example visualizations,† and information for interpretation and next steps.

The accompanying technical guide provides:

1. **Analysis summaries**—details on the steps taken to conduct the analyses. The analysis summaries provide enough detail for analysts to recreate the analyses outlined in this Diagnostic for your state, regardless of the statistical software you'll use for the analyses.

2. **Data specifications—**data sources, elements, and structures needed to complete these analyses.

3. **Code files—**Stata .do files for use (available on the OpenSDP Github).

While we offer background for the importance of each question and potential implications of results, you will need to understand the results in the context of your own state to generate action steps from these analyses. We recommend connecting with stakeholders in your state to decide which students to compare and to discuss and interpret results.

† These example visualizations are generated using synthetic data. As such, the results of your analyses will likely look different than those presented here.

HOW TO USE THE DIAGNOSTIC MOST EFFECTIVELY

This Diagnostic is designed to be a flexible framework for examining how students are progressing to and through postsecondary education and to begin to probe potential drivers of student educational and employment outcomes. The results of these analyses are designed to generate more questions, which will require further inquiry.

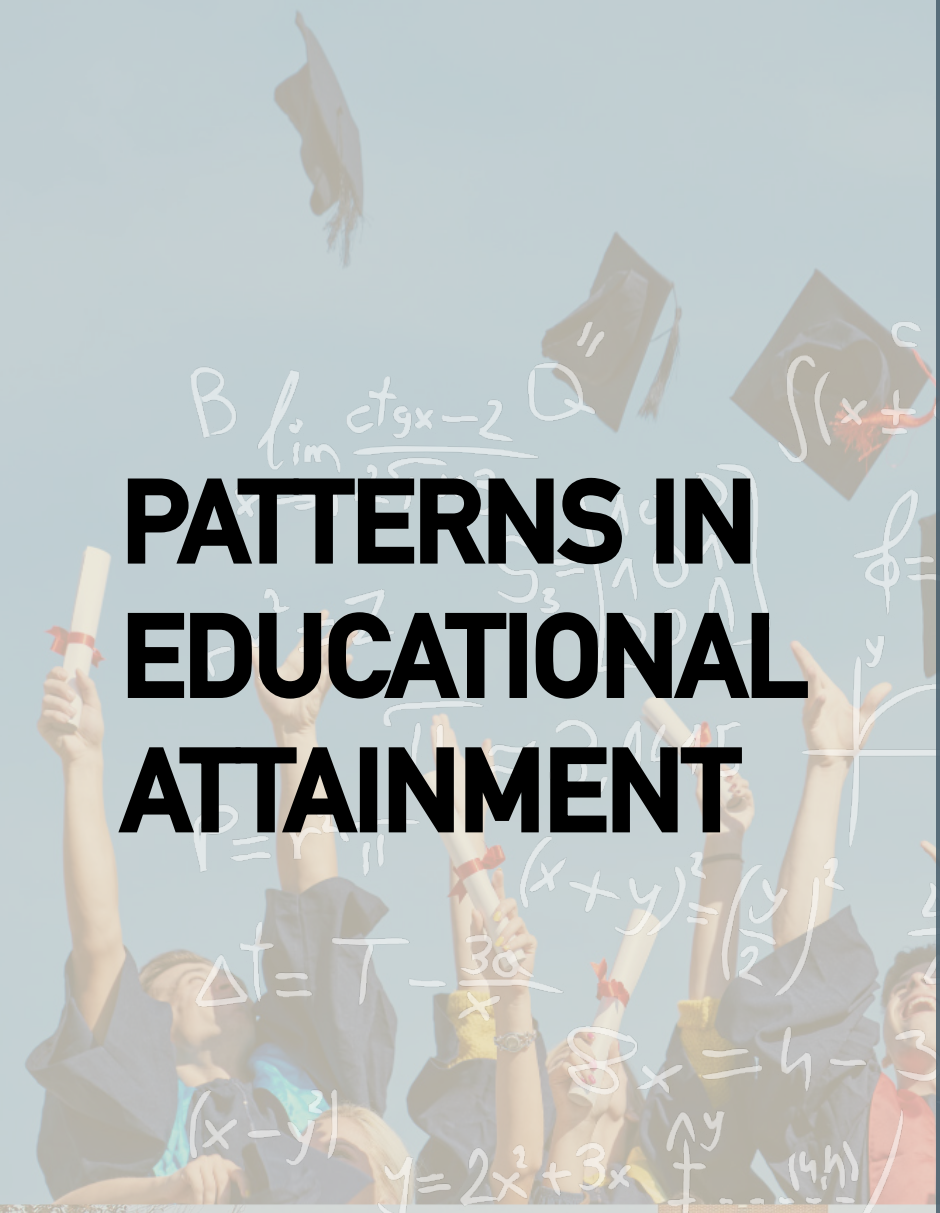
It's important to think carefully about the implications and interpretation of these results, particularly when looking at outcomes broken out by demographic characteristics. These are not causal estimates—if there are differences by gender/sex in students' likelihood of stopping out of college, for example, this does not mean that students of one gender/sex are better or more capable students.

Instead, you should take this as an opportunity to reflect on the support currently offered to students and how that support may need to be tailored to different groups so that all students have equitable opportunities to succeed. You can then work with education leaders to explore specific resources, policies, or practices that may improve student outcomes, such as financial aid, wraparound support, or dual enrollment. These interventions can then be evaluated for their effectiveness when implemented.

Approaching this Diagnostic as a resource to spark conversations and questioning around student outcomes will allow you to focus on the issues most relevant to your context and to determine next steps to support student success.

To reinforce this structure, we have organized the analyses by the specific question they help answer. By working through these questions, you can determine what challenges your state faces, and potential root causes you could address.

SECTION 1



PATTERNS IN EDUCATIONAL ATTAINMENT

CONTENTS

GOALS AND PURPOSE

- An important first step is to create a foundational understanding of students' educational outcomes after they depart from high school. In the first section of this Diagnostic, we will explore credential attainment patterns among high school graduates and describe how these patterns vary across various student academic and demographic characteristics. The results of this work will provide your state with information that can be used to track progress toward state education attainment goals, as well as identify students who may face barriers to credential attainment, providing direction for further inquiry.

ANALYSIS QUESTIONS

- A. Which state high school graduates are earning postsecondary credentials? Are some students more likely to earn certain postsecondary credentials than others?

EDUCATION TO WORKFORCE PATHWAYS DIAGNOSTIC

Section 1: Patterns in Educational Attainment

IN THIS SECTION:

Diagnostic Question 1.A: Which state high school graduates are earning postsecondary credentials? Are some students more likely to earn certain postsecondary credentials than others?

1.A.1: Percentage of Graduating Classes with Postsecondary Credentials

1.A.2: Degree Attainment by 10 years from High School by Student Demographics/Academic Characteristics

1.A.3: Percentage that Earned Postsecondary Credential within 10 Years of High School by Student Demographics and Test Score

1.A.4: Percentage of Graduation Class who Completed, are Enrolled, Stopped Out, or Never Attempted College 10 Years from High School Graduation

DIAGNOSTIC CHART 1.A.1: Percentage of Graduating Classes with Postsecondary Credentials

PURPOSE

This analysis shows the percentage of students from a given high school (HS) graduating class by highest degree 1-10 years from graduation. In this example, we break attainment into four categories: HS diploma or GED, sub-baccalaureate credentials (associate, certificate, or diploma), bachelor's degree, and graduate degree.

This chart provides several pieces of important information:

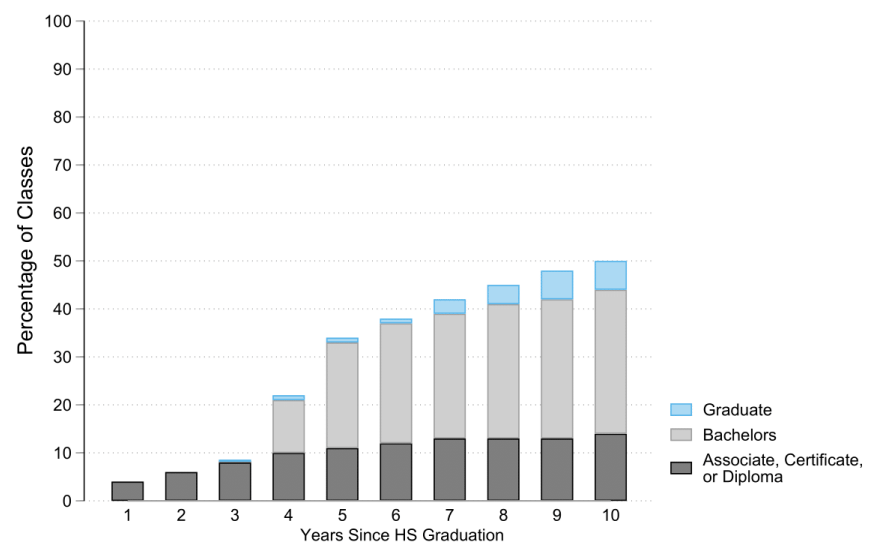
First, you can observe the most popular credential type among high school students, which can be used to benchmark progress toward state credential attainment goals or understand whether local labor market needs will be met given current trends in completion.

Second, you can observe how long it typically takes students to complete a credential, providing valuable insights into the extent to which students need more support to be able to complete degrees (and enter the workforce) more rapidly.

ANALYTIC TECHNIQUE

Calculate the percentage of students with each degree type in each year after high school graduation.

Diagnostic Chart 1.A.1: Percentage of Graduating Classes with Postsecondary Credentials



UNDERSTANDING THE CHART

In Diagnostic Chart 1.A.1, each bar shows the percentage of a given high school class that has earned a specific type of post-secondary credential each year after HS graduation. The sections of the bars represent the percentage of students who have each credential. For example, in year 10, about 50% of graduates have a college degree.

When interpreting this chart, you should pay attention to the size of each portion of the stack over time. For example, below we see that students do not tend to earn bachelor's degrees until five to seven years after high school graduation. This indicates that analyses examining time to degree in this state should consider timeframes beyond the four years traditionally assumed to complete bachelor's degrees. We also see that most students earn their credentials within the first seven years after HS graduation, which indicates that state policies can leverage students' current engagement with colleges in the years immediately after HS graduation to encourage degree completion; however, new measures may be needed to re-engage adults who have been disconnected from the education system for a longer period of time.

ASK YOUR TEAM

- How do these results compare to state education attainment goals and workforce needs?
- How long does it typically take students to complete a credential?
- How do these timelines align with projected workforce needs and state education attainment goals?

FROM ANALYSIS TO ACTION

- Brainstorm potential root causes of attainment rates among your state's students.
- Repeat with other graduating classes to examine how attainment has changed over time.

DIAGNOSTIC CHART 1.A.2: Degree Attainment by 10 years from High School by Student Demographics/Academic Characteristics

PURPOSE

Prior research suggests that student background characteristics such as race, socioeconomic status, and academic preparation are predictive of degree attainment (see Table 2 for further reading). This analysis helps states understand which students may be less likely to attain postsecondary credentials than their peers.

To uncover disparities in attainment, this analysis plots the percentage of students from a given high school graduating class by highest credential 10 years from graduation broken out by demographic and academic characteristics. We show four categories of attainment: HS diploma or GED, sub-baccalaureate credentials (associate, certificate, or diploma), bachelor's degree, and graduate degree.

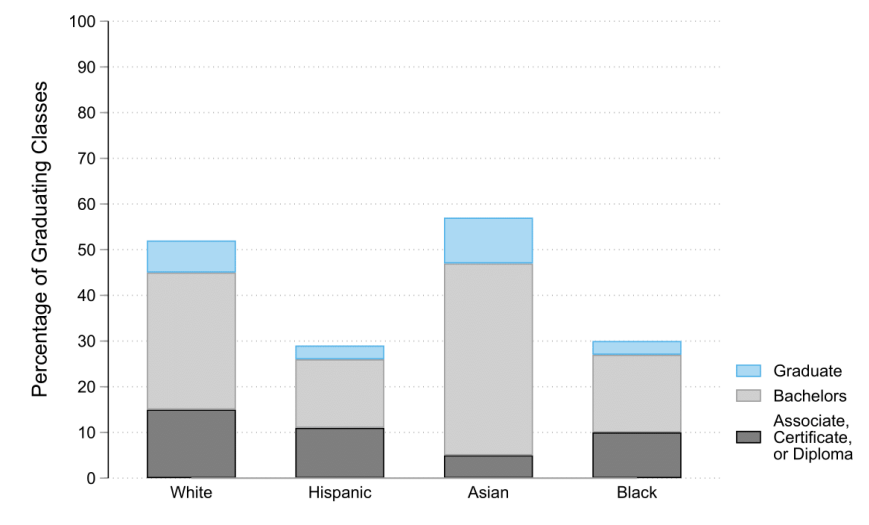
The results of these analyses will help your state identify groups of students who may need additional support on the path to credential attainment.

We recommend comparing these results with college entry and stop out rates (analyses in sections 2 and 3) for each demographic group. If, for example, male students are less likely than female students to attain postsecondary credentials, is this because they are less likely to enter college, less likely to complete once enrolled, or a combination of the two?

ANALYTIC TECHNIQUE

Calculate the percentage of students with each degree type by demographic characteristics at the 10th year after high school graduation.

Diagnostic Chart 1.A.2: Degree attainment by 10 years from High School by Race/Ethnicity



UNDERSTANDING THE CHART

Diagnostic Chart 1.A.2 shows the percentage of students in a given high school class by highest credential and demographic characteristics 10 years from HS graduation. Each bar represents a different demographic group (here, we show racial/ethnic groups to illustrate the chart type; we also provide guidance to examine groups based on gender/sex, socioeconomic status, and other student characteristics).

When interpreting this chart, pay attention to the size of each portion of the stack and compare across bars, which represent groups of students. The height of the bar indicates what percentage of students in that group have a postsecondary credential within 10 years of HS graduation.

The portions within the stacked bar note what percentage of students have a specific postsecondary credential in the year measured. The example below shows that, in year 10 after high school, about 60% of Asian students have a postsecondary credential. Within that, about 10% have a graduate degree. Overall, we see that White and Asian graduates were most likely to earn postsecondary credentials and Asian students were far more likely to have bachelor's and graduate degrees. Analyses in future sections will provide insight into potential drivers of differences in credential attainment across student populations.

ASK YOUR TEAM

- What might explain variation in credential attainment rates among different student groups?

FROM ANALYSIS TO ACTION

- Examine multiple time horizons (five years, seven years, 12 years, etc.) to understand if credential completion patterns change with time.
- Based on results from enrollment and stop out analyses in future sections, brainstorm potential root causes of differences in attainment rates across populations.
- Drawing on the research highlighted in the **Education-to-Workforce Framework** (44), we suggest completing further analyses disaggregated by characteristics like race/ethnicity, socioeconomic status, and school locale (e.g. rural).
  - **Sex** (or gender, if you can disaggregate beyond traditional binary values)
  - **Race/ethnicity**
  - **Student socioeconomic status.** Traditionally, researchers have used an indicator for whether the student received Free and Reduced-Price Lunch (FRPL) Status. This has fallen out of favor given the introduction of school-wide lunch programs, so it will be important to take your state's context into consideration when choosing this variable—for example, you could use the poverty rate in the student's home zip code if available, or some other measure.
  - **Academic achievement**. We suggest using scores from a standardized test taken near the end of high school. Using standardized test scores will allow you to compare students to one another, regardless of where they went to high school or when they graduated. We also suggest you use a test close to the end of high school to reduce problems with missingness. You may also complete these analyses using earlier measures of achievement. By comparing outcomes by tests taken at different times throughout students' careers, you may be able to better understand when academic intervention is most effective.
  - **School characteristics**, such as locale or the percentage of students in a school receiving FRPL. These measures will allow you to assess the extent to which school environment predicts individual attainment.

DIAGNOSTIC CHART 1.A.3: Percentage that Earned Postsecondary Credential within 10 Years of High School by Student Demographics and Test Score

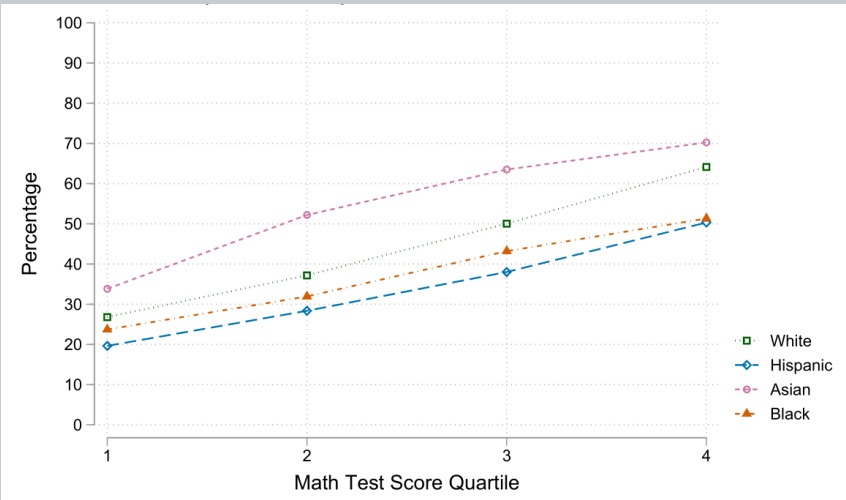
PURPOSE

This analysis examines the extent to which academic achievement in high school is related to variation in attainment across students. This analysis is useful to identify students with similar incoming achievement profiles but divergent credential attainment rates and students with similar credential attainment but different academic performance.

ANALYTIC TECHNIQUE

Calculate the percentage of students in each demographic and test quartile group who have

Diagnostic Chart 1.A.3: Percentage that Earned Postsecondary Credential within 10 Years of High School by Race/Ethnicity and Math Test Score



UNDERSTANDING THE CHART

Diagnostic Chart 1.A.3 plots the percentage of high school graduates from a given demographic group who complete a postsecondary credential 10 years after high school by their score quartile on a standardized test.

The numbers on the horizontal axis note test quartile groups (1 is lowest, 4 is highest) and each line corresponds to a different demographic group (in this case, racial/ethnic group). The vertical axis shows the percentage of students within each demographic and test quartile group who have earned a college credential within 10 years of HS graduation.

The size of the markers indicates the relative size of each group. When interpreting this chart, you should examine how attainment varies within and across test quartiles. Looking across test quartiles illustrates the relationship between achievement and attainment for all populations.

In the example provided, all the lines tracking attainment across test score quartiles have a positive slope, meaning that as scores increase, so does the likelihood of attainment. Looking within a test score quartile highlights differences across students with similar prior academic achievement. For example, in the fourth quartile we see that 70% of Asian students earned a credential, while about 50% of Black and Hispanic students who achieved similar scores earned a credential.

It is also important to look for similarities between groups within test quartile. For example, we see that attainment rates are similar for white, Black, and Hispanic students in the first quartile, indicating that academic preparation is likely a barrier to completion for these students.

ASK YOUR TEAM

- What might explain variation in credential attainment rates for students with similar high school achievement?
- What are the implications of small and large attainment gaps among students who score the same in quartile?
- What are the implications of large or small attainment gaps in the highest versus the lowest quartiles?
- What supports could colleges be providing that facilitate similar credential completion rates across students with varying levels of HS achievement?

FROM ANALYSIS TO ACTION

- Repeat this analysis to include other student characteristics, such as gender/sex or socioeconomic status.
- Compare this chart to the distribution of students within each test score quartile. Are certain students more likely to have scores in certain quartiles?

DIAGNOSTIC CHART 1.A.4: Percentage of Graduation Class who Completed, are Enrolled, Stopped Out, or Never Attempted College 10 Years from High School Graduation

PURPOSE

This analysis provides a snapshot of students' progression towards postsecondary credentials 10 years after high school graduation. Here, we plot the percentage of graduates who completed a credential, began a program but stopped out prior to completion, are currently enrolled without a degree, and who never attempted college.

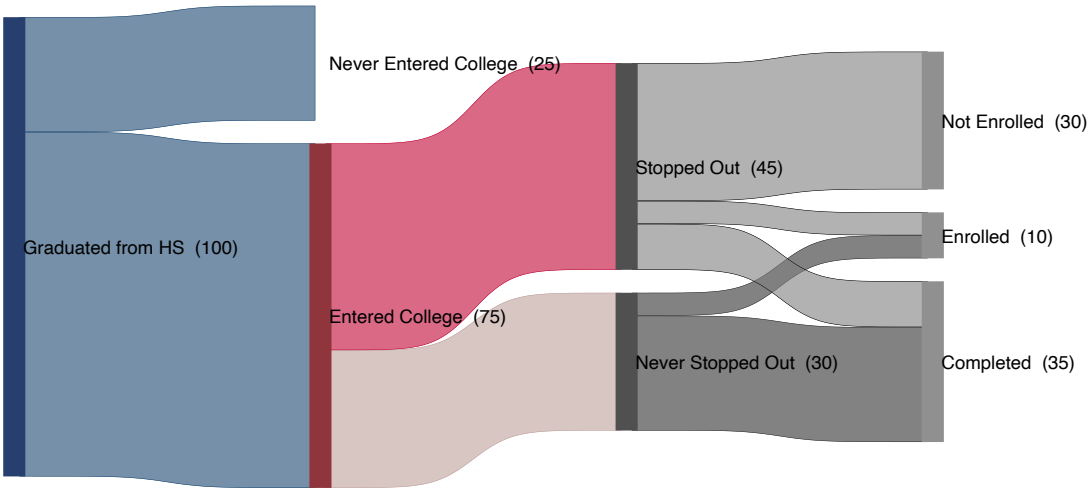
The results of this analysis will help you begin to diagnose drivers of credential attainment rates, which you will explore more deeply in sections 2 and 3. In other words, are low completion rates due to students never attempting college or students stopping out before completion?

ANALYTIC TECHNIQUE

First, calculate the proportion of students who entered college within 10 years of high school graduation. Then, calculate the percentage of students who entered college and stopped out, as defined by leaving college for at least one year.

Next, calculate the percentage who stopped out and were not enrolled, were enrolled, or had completed a credential in year 10. Finally, calculate the percentage who never stopped out and were enrolled or had completed a credential in year 10.

Diagnostic Chart 1.A.4: Percentage of Graduation Class who Completed, are Enrolled, Stopped Out, or Never Attempted College 10 Years from High School Graduation



Sample includes class of X measured 10 years after HS graduation
Stopout defined as students who enrolled in at least 1 semester of college and stopped out for at least 1 year prior to degree completion

UNDERSTANDING THE CHART

Diagnostic Chart 1.A.4 traces students from a given high school class for 10 years following high school graduation to show engagement with college. When interpreting this graph, you should pay attention to the size of the flows and the overlain percentages. In the example below, we see that around 40% of state graduates began but had not completed a degree 10 years after graduating high school. This is close to double the rate of students who never attempted college, indicating that college stop out is likely a larger driver of completion than students not initially enrolling in this context.

ASK YOUR TEAM

- How do these results compare to state education attainment goals and workforce needs?
- What could be causing students to not enter college or stop out in your state?

FROM ANALYSIS TO ACTION

- Repeat this analysis by student subgroup, high school, or district to identify which students are at most risk of not earning a degree and at what point in the journey they are deterred from a postsecondary credential.

SECTION 2

K12 TO COLLEGE ENROLLMENT

CONTENTS

GOALS AND PURPOSE

In the second section of this Diagnostic, you will explore college enrollment across various student academic and demographic characteristics to better understand drivers of credential completion rates. Armed with this information, education leaders can identify students who might need guidance preparing for and navigating the college enrollment process. In this section we answer the following questions:

ANALYSIS QUESTIONS

- A. How many high school graduates go to college? Where and when do they enroll?
- B. Are some students more likely to enter post-secondary pathways than others?

EDUCATION TO WORKFORCE PATHWAYS DIAGNOSTIC

Section 2: K12 to College Enrollment

IN THIS SECTION:

DIAGNOSTIC CHART 2.A.1: Percentage of Graduating Class Entering College 1-5 Years from High School

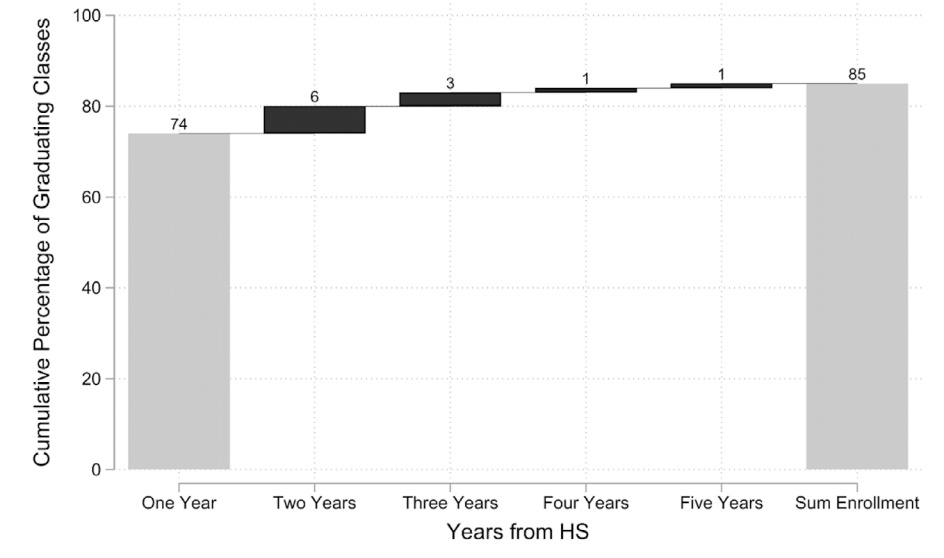
PURPOSE

The timing of a student's initial enrollment in college is critical, as prior research has demonstrated that students who delay enrollment are less likely to persist to graduation (1). This analysis highlights how many graduates attend college and helps diagnose the extent of delayed enrollment in your state.

ANALYTIC TECHNIQUE

Calculate the percentage of students who enroll in college by time elapsed since high school graduation.

Diagnostic Chart 2.A.1: Percentage of Graduating Class Entering College 1-5 Years from High School



UNDERSTANDING THE CHART

Diagnostic Chart 2.A.1 shows the cumulative percentage of a graduating class that has enrolled in college by a given year after high school. The gray bars represent cumulative sums, and the black bars represent additional enrollees each year. For example, the first bar shows that almost 74% of students enrolled in the first year after graduation. The second bar shows that an additional five percent enrolled by year two. We can continue adding the numbers over the black bars to the sum shown in the left bar until we arrive at the right-most gray bar, which represents the sum over time. This example chart shows that most students enrolled in college within a year after high school graduation. This suggests that encouraging immediate college enrollment is a critical leverage point for improving progression toward degree attainment in your state.

ASK YOUR TEAM

- When are students most likely to enroll in college?
- What could prevent students from enrolling immediately after high school?

FROM ANALYSIS TO ACTION

- Replicate this analysis to include all first-time ninth graders (i.e., ninth grade cohorts) in place of graduates to understand where in the high-school-to-college credential timeline students become disengaged from formal education.
- Additionally, create individual high school reports that provide more details for school administrators.

DIAGNOSTIC CHART 2.A.2: Percentage of Enrolled Graduating Class by College System One Year from High School

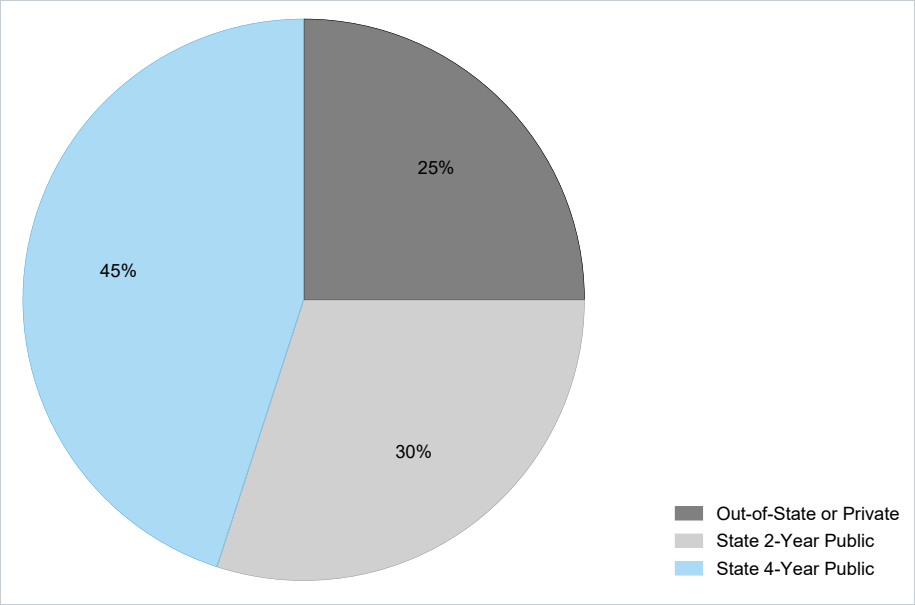
PURPOSE

Given many states' emphasis on increasing the number of college-educated workers in-state, your state may be interested in where high school graduates attend college. This analysis charts the percentage of students who enrolled in college one year from graduation by college system.

ANALYTIC TECHNIQUE

Calculate the proportion of students who enroll in college within one year of HS graduation by college system.

Diagnostic Chart 2.A.2: Percentage of Enrolled Graduating Class by College System One Year from High School



UNDERSTANDING THE CHART

Diagnostic Chart 2.A.2 shows the percentage of students in a given high school graduating class who have enrolled in college within one year of graduation by institutional control (e.g. public, private) and location. When interpreting this graph, you should pay attention to the size of the pie slices and the percentage shown on each slice. This graph indicates that most students enroll in-state and most of those students attend public four-year colleges.

ASK YOUR TEAM

- Are these patterns in enrollment expected? Can your institutions sustain these enrollment patterns?
- What types of credentials may students be able to attain, given where they are enrolling? How do these potential degrees align to workforce needs?

FROM ANALYSIS TO ACTION

- Replicate analysis examining enrollment by measures of selectivity, social mobility ranking, or flagship status.
- Explore college enrollment in the fall immediately after graduation or within two years of high school completion.

DIAGNOSTIC CHART 2.B.1: Percentage of High School Graduating Classes Enrolled in College by Student Demographic/Academic Characteristics

PURPOSE

As demonstrated in Section 1 of this diagnostic, educational attainment varies by student characteristics. Perhaps not surprisingly, prior research suggests that student background is also predictive of college enrollment (see sources in Table 2).

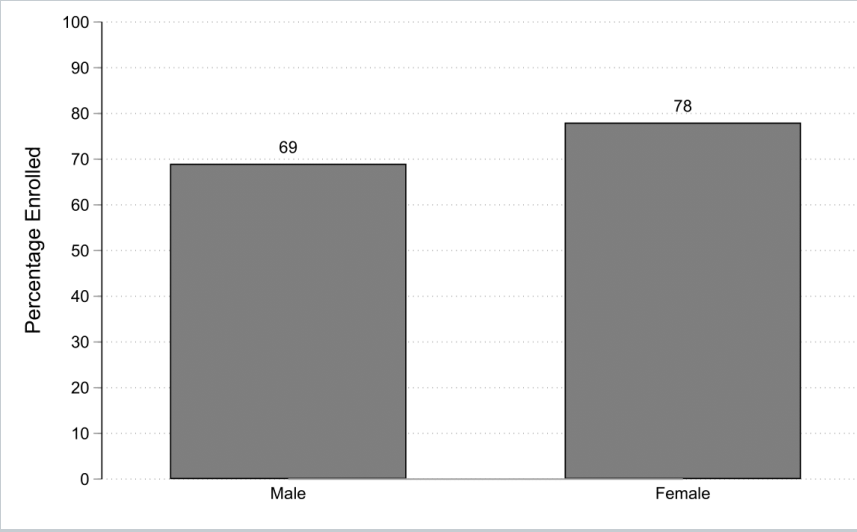
Understanding how college enrollment varies across student populations can empower educators to identify for whom and in what domains evidence-based and innovative approaches to student support are needed to improve student outcomes.

This analysis plots the percentage of students who enroll in college one year after high school graduation by student background characteristics. We examine entry within one year because those who enroll in college immediately after high school are more likely to earn a credential than those who delay enrollment (1-3).

ANALYTIC TECHNIQUE

Calculate the percentage of students who enroll in college within one year of high school graduation by demographic characteristics.

Diagnostic Chart 2.B.1: Percentage of High School Graduating Classes Enrolled in College by Sex



UNDERSTANDING THE CHART

Diagnostic Chart 2.B.1 shows the percentage of high school graduates who attended college immediately after high school broken down by a given demographic characteristic (in this case, the bars show enrollment for male and female students). The vertical axis shows the percentage of students in each group who have enrolled in college within one year of high school graduation.

When interpreting this chart, you should pay attention to the height of the bars relative to one another and the percentages shown on the graph. As seen in the example below, the bar for females is higher than males, indicating that female students are more likely to attend college.

ASK YOUR TEAM

- What might explain variation in college enrollment rates among different student groups?

FROM ANALYSIS TO ACTION

- Based on the research highlighted in the Education-to-Workforce Framework (44), we suggest completing further analyses disaggregated by characteristics like race/ethnicity, socioeconomic status, and school locale.
- Also consider repeating this analysis to include all first-time ninth graders (i.e., ninth grade cohorts) in place of graduates and explore college enrollment the fall immediately after graduation or within two years of high school completion.

DIAGNOSTIC CHART 2.B.2: Percentage Enrolled in College One Year After High School by Demographic Characteristics and Test Scores

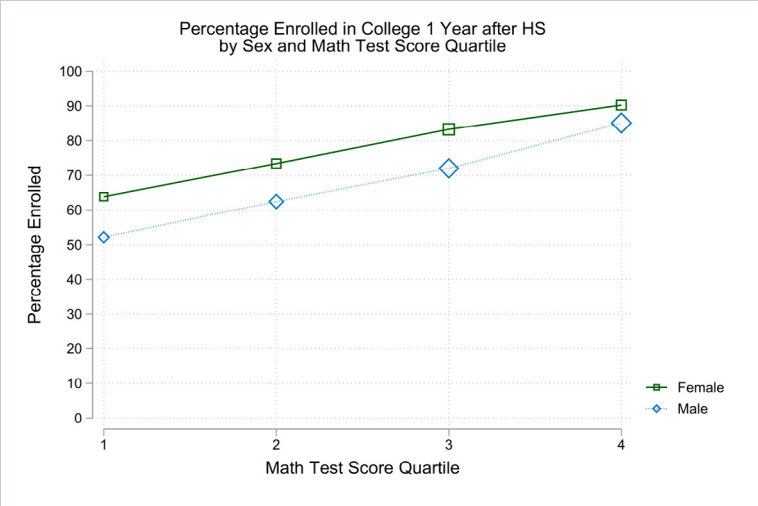
PURPOSE

This analysis examines the extent to which academic achievement in high school explains observed differences in college going across student groups. This analysis is useful to identify groups of students with similar incoming achievement profiles but divergent college enrollment rates or students with similar college-going rates but different academic performance. As above, we examine college enrollment within one year of high school graduation.

ANALYTIC TECHNIQUE

Calculate the percentage of students in each demographic and test quartile group who entered college within one year of high school graduation.

Diagnostic Chart 2.B.2: Percentage Enrolled in College One Year After High School by Sex and Math Test Scores



UNDERSTANDING THE CHART

Diagnostic Chart 2.B.2 plots the percentage of students from a given demographic group who enroll in college by their score on a high school standardized test. The numbers on the horizontal axis note test quartile groups (1 is lowest, 4 is highest) and each line corresponds to a different demographic group (in this case, sex). The vertical axis shows the percentage of students within each demographic and test quartile group who enrolled in college within one year of HS graduation. The size of the markers indicates the relative sample size for each group.

When interpreting this chart, you should examine how enrollment varies within and across test quartiles. In the example provided, we see that the lines tracking enrollment across test score quartiles have positive slopes, meaning that, as scores increase, so does the likelihood that a student will attend college, regardless of their demographic characteristics.

When looking within test score quartile, we see that female students are more likely to attend college than male students. For example, in the fourth quartile we see that 90% of female students attended college, while 85% of male students who achieved similar scores attended college.

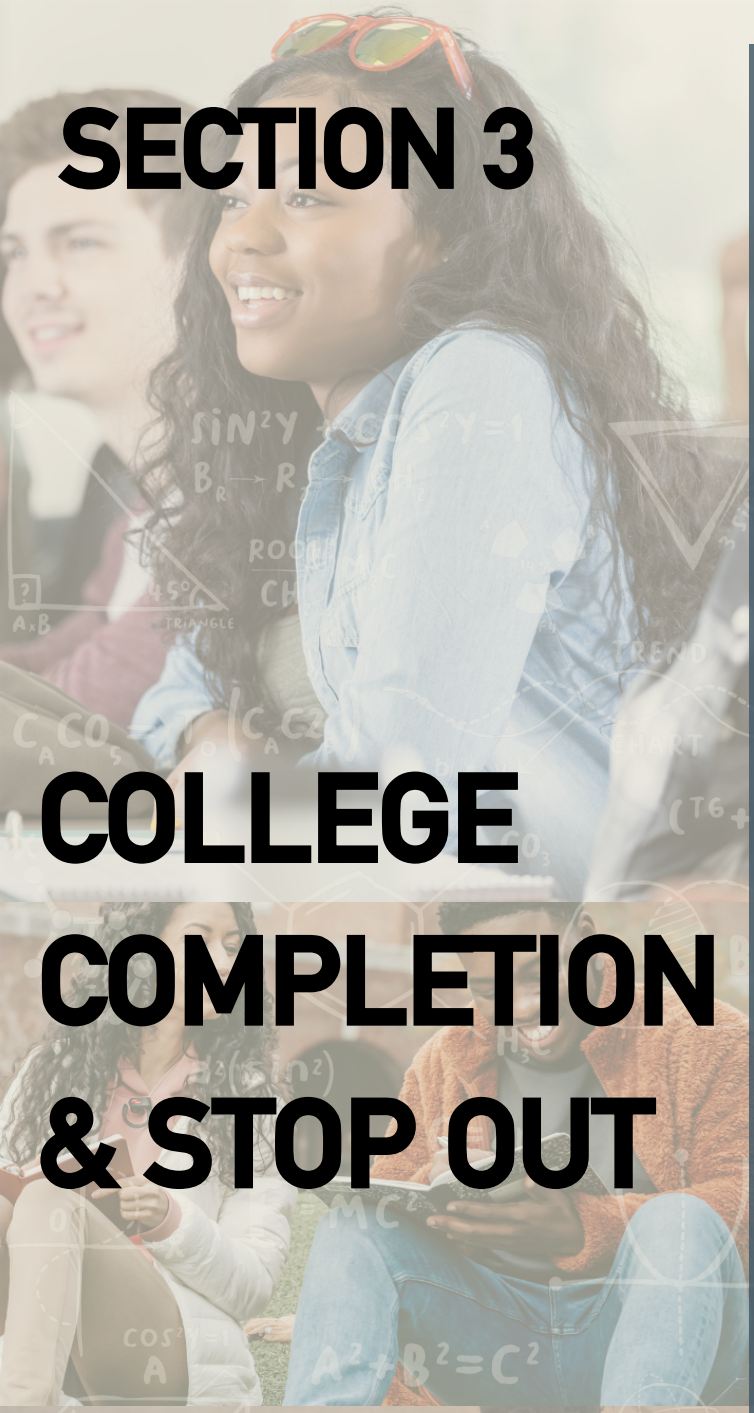
It is also important to look for similarities between groups within test quartile. If we see that attainment rates are similar for students in a particular quartile, this may indicate that academic preparation has a stronger influence on outcomes for those students.

ASK YOUR TEAM

- What might explain variation in college enrollment rates for students with similar high school achievement?
- What are the implications of small and large enrollment gaps among students who score in the same in quartile?
- What are the implications of large or small enrollment gaps in the highest versus the lowest quartiles?
- What supports could schools be providing that facilitate similar enrollment rates across students with varying levels of high school achievement?

FROM ANALYSIS TO ACTION

- Repeat this analysis to include other student characteristics, such as race/ethnicity or socioeconomic status.
- Repeat this analysis to include all first-time ninth graders (i.e., ninth grade cohorts) in place of graduates and explore college enrollment within two years of high school completion.
- Compare this chart to the distribution of students within each test score quartile. Are certain students more likely to score in certain quartiles? Consider what structures or supports are in place to help students succeed no matter their academic background.
- Explore, design, and test interventions aimed specifically at exploring postsecondary options for academically underprepared students and student groups you have found are least likely to enroll.



SECTION 3

COLLEGE COMPLETION & STOP OUT

CONTENTS

GOALS AND PURPOSE

While enrolling in college is a key milestone on the path to economic mobility and security, attaining a credential can unlock the full economic benefits of a college education. However, students often face significant barriers to completion after surmounting the initial barriers to enrollment. To highlight these roadblocks, we examine enrollment behaviors and composition of college stop outs (9, 10). The results highlighted in this section will provide state education leaders with information needed to identify students who might need more support once enrolled and to plan re-enrollment campaigns. In this section, we answer the following questions:

ANALYSIS QUESTIONS

- A. Which state high school graduates stop out of college? Which students are more likely to stop out than others?
- B. What are the re-enrollment behaviors of college stop outs?

Note: The analyses in this section are limited to **college attempters**—high school graduates from the state who enrolled in a postsecondary institution for at least one semester. Depending on your data source, this may be limited to students enrolled in a certain type of institution (e.g., in-state, public institutions).

For these analyses, we define a **stop out** as a student who:

1. Was enrolled in college for at least one semester.
2. Did not have a college degree prior to their first term of enrollment.
3. Did not complete a college degree.
4. Was not enrolled at the time degree completion was measured.

This definition is adapted from work by the National Student Clearinghouse (9). You may identify stop outs differently based on your local context. Unlike sections 1 and 2, the analyses for stop out require data transformations. **Please see the technical guide for more details.**

EDUCATION TO WORKFORCE PATHWAYS DIAGNOSTIC

Section 3: College Completion and Stop Out

IN THIS SECTION:

DIAGNOSTIC CHART 3.A.1: Percentage of Postsecondary Attempters by Enrollment Status Six Years after College by Student Demographic/Academic Characteristics

PURPOSE

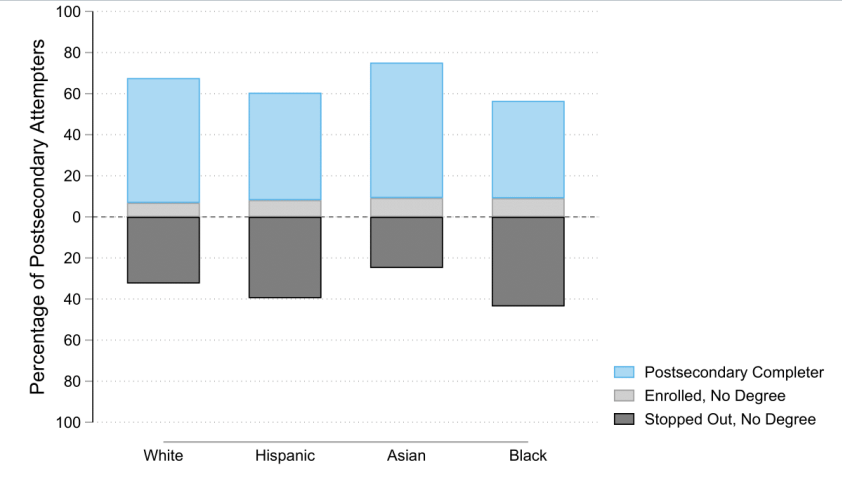
To direct postsecondary institutions' efforts towards students who may need additional support to persist, we examine stop out by student characteristics. Specifically, we plot the percentage of postsecondary attempters who completed a credential, stopped out, or are currently enrolled six years after college entry.

ANALYTIC TECHNIQUE

Calculate the proportion of postsecondary enrollees who completed a credential, stopped out, or are still currently enrolled six years after college entry. We have chosen to measure a student's enrollment status at

six years after college entry, as it represents 150% of the time it should take to complete a bachelor's degree. You may change the time horizon for these analyses based on your sample and interests (e.g., measuring status at three years post-entry for those attempting sub-baccalaureate degrees).

Diagnostic Chart 3.A.1: Percentage of Postsecondary Attempters by Enrollment Status Six Years After College Entry by Student Demographic/Academic Characteristics



UNDERSTANDING THE CHART

Diagnostic Chart 3.A.1 shows the percentage of postsecondary attempters who have completed college or are currently enrolled broken out by demographic characteristics. The example below shows outcomes broken out by race/ethnicity.

When interpreting this chart, you should pay attention to the size of each portion of the stack and compare across bars, which represent groups of students. The height of the bar above zero notes what percentage of attempters have not stopped out. The portions within the stacked bar note what percentage of attempters completed or are still enrolled. The height of the bar below zero notes what percentage of attempters have stopped out.

In the example provided, we see that Black and Hispanic students are far more likely to stop out than their White and Asian peers. This indicates that these students may need additional support from their institutions once enrolled.

ASK YOUR TEAM

- What may explain variation in college stop out and completion across student groups?
- What practices, policies, or structures might be supporting or hindering student persistence and completion?
- What individual-level factors or causes outside of the institution may be impacting student persistence and completion?
- How do students at risk of stopping out compare to those you have identified as potentially facing barriers enrolling in college?

FROM ANALYSIS TO ACTION

- National data on college stop out suggests that students of color, female students, and community college enrollees are more likely to exit college before degree completion (10). Therefore, we suggest repeating these analyses by different demographic groups and institutional types.

DIAGNOSTIC CHART 3.A.2: Percentage of Postsecondary Attempters Who Stopped Out by Demographic Characteristics and Test Score

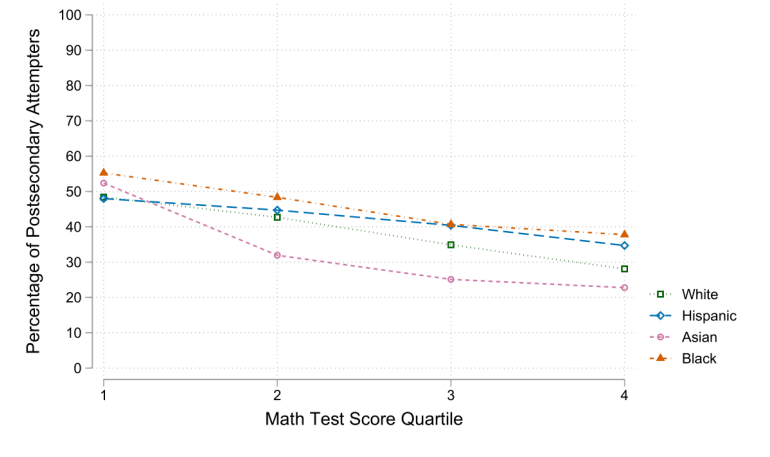
PURPOSE

This analysis displays variation in stop out rates across student groups by examining the relationship between academic achievement in high school and stop out. This analysis highlights how student outcomes may diverge despite similar academic preparation (or other characteristics).

ANALYTIC TECHNIQUE

Calculate the percentage of students in each demographic and test quartile group who have entered college and stopped out within six years of college entry.

Diagnostic Chart 3.A.2: Percentage of Postsecondary Attempters who Stopped Out by Race/Ethnicity and Math Test Score



UNDERSTANDING THE CHART

Diagnostic Chart 3.A.2 plots the percentage of college attempters from a given demographic group who stop out of college by their score on a high school standardized test.
The numbers on the horizontal axis note test quartile groups and each line corresponds to a different demographic group (in this case, racial/ethnic group). The vertical axis shows the percentage of students within each demographic and test quartile group who stopped out of college within six years of entry.

The size of the markers indicates the relative sample size for each group. When interpreting this chart, you should examine how stop out varies within and across test quartiles. In the example provided, we see that the lines tracking stop out across test score quartiles have a negative slope, meaning that, as scores increase, the likelihood of stop out decreases.

When looking within test score quartile, we see that Black students are most likely to stop out as compared to their peers from other racial/ethnic groups. In the fourth quartile, we see that almost 40% of Black students stopped out of college, compared to about 22% of Asian students with similar prior scores. We can also see in this chart that, in the first quartile, stop out rates among white, Asian, Hispanic, and Black students are quite similar. This indicates that campaigns to prevent stop out may be more effective if targeted toward students with lower demonstrated academic achievement in high school.

ASK YOUR TEAM

- What might explain variation in stop out rates for students with similar achievement in high school?
- What practices, policies, or structures might be leading to differences in stop out among students with similar prior achievement?
- What are the implications of a small gap in stop out rates among students who score the same in quartile?
- What are the implications of large or small gaps in stop out rates in the highest versus the lowest quartiles?

FROM ANALYSIS TO ACTION

- Repeat this analysis to include other student characteristics, such as sex or socioeconomic status.
- Compare this chart to the distribution of students within each test score quartile. Are certain students more likely to score in certain quartiles?
- Explore, design, and test interventions aimed specifically at preventing stop out among academically underprepared students or students who are most likely to depart the institution before completion.

DIAGNOSTIC CHART 3.A.3: Percentage of Degree Attempters Who Stopped Out by Number of Credits/GPA Earned in First Semester

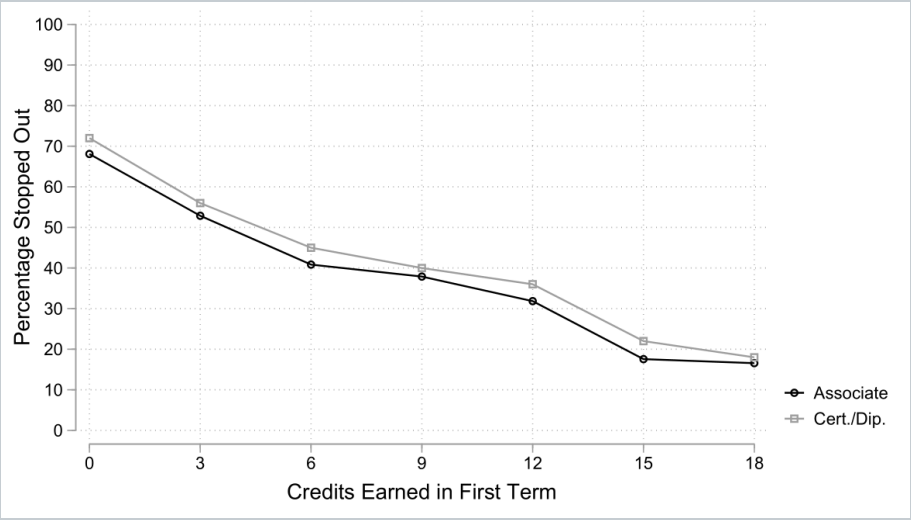
PURPOSE

The analyses presented thus far in this section relied on pre-college characteristics to explore stop out; however, students' experiences once enrolled, especially their academic performance, also influence their persistence to degree completion. To help institutions identify key junctures for stop out prevention interventions, we look at the relationship between students' academic performance in their first term, specifically credit accumulation and GPA, and stop out.

ANALYTIC TECHNIQUE

Calculate the percentage of college attempters within degree type who stop out within three or six years of initial college entry by credits earned or GPA in the first semester. For bachelor's degree attempters, we have chosen to measure a student's enrollment status at six years after college entry, as it represents 150% of the time it should take to complete the degree. For sub-baccalaureate degree attempters, we have chosen to measure enrollment at three years post entry. These time horizons can be changed based on your sample or knowledge of degree programs in your state.

Diagnostic Chart 3.A.3: Percentage of Sub-Baccalaureate Degree Attempters Who Stopped Out by Number of Credits/GPA Earned in First Semester



Credits earned in the first term are grouped into three-credit intervals, labeled by the maximum of the interval

UNDERSTANDING THE CHART

Diagnostic Chart 3.A.3 below plots the percentage of students who stop out by credits earned in the first term and attempted degree type. The horizontal axis represents bins for accumulated credits or GPA. The vertical axis represents the percentage of college attempters who stopped out within each credit/GPA bin. Each line corresponds to a different attempted degree type.

When interpreting this chart, you should pay attention to the slope of the lines and which lines fall higher on the graph. In this example chart, we see that the slopes of all the lines are negative—meaning that students who earned fewer credits in their first term were less likely to complete their credentials.

Further, the line for certificate/diploma attempters is higher than the line for associate degree (AA) attempters, indicating that AA students were generally less likely to stop out. These figures highlight the importance of early momentum in predicting longer-term success and indicate that institutions may want to provide additional support to students who earn a limited number of credits or perform poorly in their first term.

ASK YOUR TEAM

- What programs do colleges and universities in your state have that are aimed at supporting student academic success in the first semester?
- What do you know about the reach and effectiveness of these programs?
- Why might stop out rates be higher among those attempting different degrees?
- Are there certain gateway or developmental courses that may be driving down GPAs or earned hours?

FROM ANALYSIS TO ACTION

- Repeat these analyses by institution or disaggregate by student demographic characteristics.
- Explore, design, and test interventions aimed specifically at bolstering student performance in the first term.

DIAGNOSTIC CHART 3.A.4: Credits Away from Degree Minimums at First Stop Out

PURPOSE

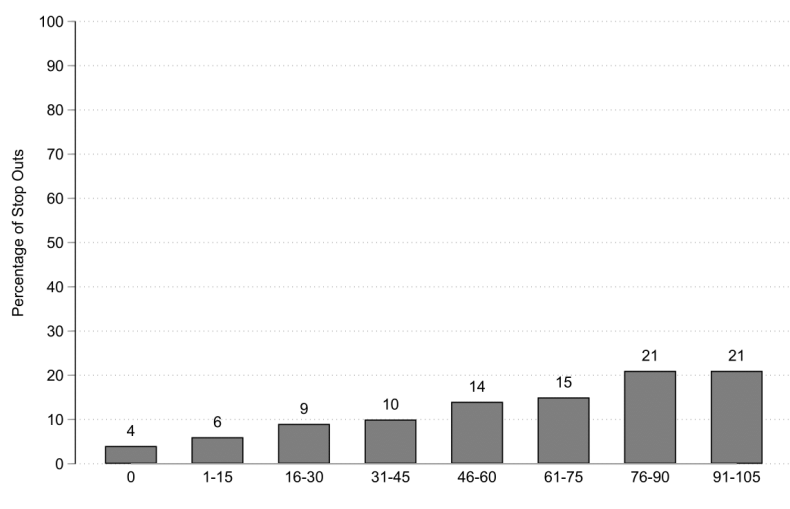
To better understand how many students who have stopped out were within striking distance of a credential when they exited the institution, we plot the percentage of stop outs by the number of credits they were from the minimum required credits for their attempted credential.

These types of analyses can help direct re-engagement campaigns at students who are close to completing a degree and provide a starting point to examine the specific conditions and experiences students underwent immediately prior to stopping out (e.g., did they attempt a particular type of course, did their academic performance change, etc.).

ANALYTIC TECHNIQUE

Calculate the number of credits a student was away from the minimum required credits for their attempted credential. Bin credits into 15-hour intervals and plot the percentage of stop outs who fall into each category.

Diagnostic Chart 3.A.4: Percentage of Stop Outs by Number of Credits Away from Bachelor's Degree Minimum



UNDERSTANDING THE CHART

Diagnostic Chart 3.A.4 shows the percentage of stop outs by the number of credits they were away from credit hour requirements for specific degree types at the time they stopped out.

Each bar represents a different credit hour bin, and the vertical axis represents the percent of stop outs who fall into each bin. The credit hour minimum will depend on your context. In this case, for BA attempters, it was 120 credit hours.

This analysis is general and only considers the overall number of credits earned, not the number earned that apply to their degree programs. For example, if a student completed 96 credits by the time they stopped out, we would place them in the 16–30-hour bin, as they were 24 credits away from the 120-hour degree minimum. Overall, this example chart shows that a majority of stop outs were more than one year of full-time academic work away from the degree minimum for the BA degree.

ASK YOUR TEAM

- How might re-enrollment campaigns target students differently based on how far away they are from their degrees?
- Should re-enrollment campaigns only focus on a subset of students?

FROM ANALYSIS TO ACTION

- Repeat these analyses by institution or disaggregate by student demographic characteristics.
- Rather than looking at credit minimums, repeat the analysis with specific degree requirements (e.g. how many courses count towards a degree?).

DIAGNOSTIC CHART 3.B.1: Percentage of Stop Outs Who Re-enrolled within Five Years of Departure

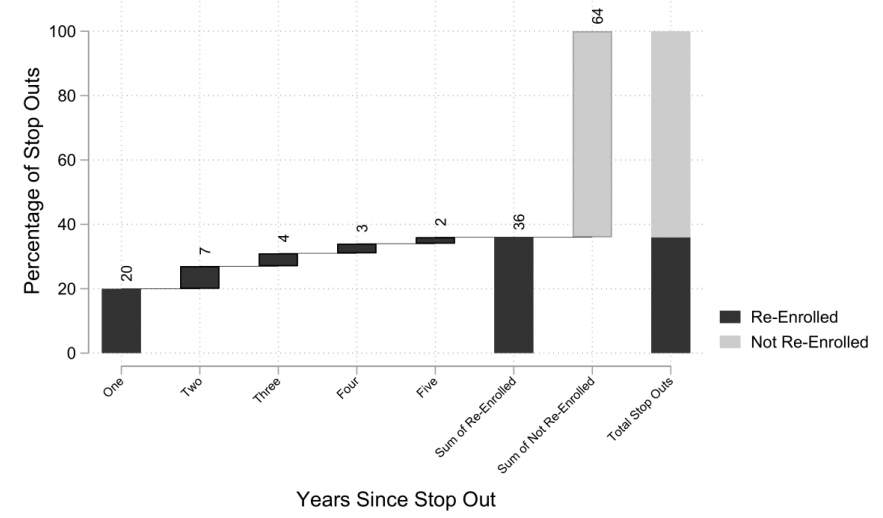
PURPOSE

This analysis plots patterns in the timing of re-enrollment for stop outs. The results of this analysis will help postsecondary institutions gain a baseline understanding of the extent to which students re-enroll and when.

ANALYTIC TECHNIQUE

Calculate percentage of stop outs who return by duration of stop out.

Diagnostic Chart 3.B.1: Percentage of Stop Outs who Re-enrolled within Five Years of Departure



UNDERSTANDING THE CHART

Diagnostic Chart 3.B.1 shows the cumulative percentage of stop outs who have returned to college by a given year after departure. The leftmost bar shows the share of students who re-enroll within a year of initially stopping out (in this example, 20% of students). The subsequent four bars show the additional share of stopped-out students who re-enroll two to five years after initially exiting. The sixth bar shows the total share of students who stop out and re-enroll within five years (in this example, 36%). The seventh bar shows the share of students who stop out and do not re-enroll within five years (in this case, 64%). Finally, the rightmost bar combines the data in the previous two bars and shows the percentage of students who stop out and do and do not re-enroll within five years.

ASK YOUR TEAM

- How many of your students who stop out return within five years?
- How do current re-enrollment campaigns target students?
- How can messaging appeal to students who have been absent from the college for more than two years?
- What practices or structures do institutions currently have in place to support returning students, and what gaps might there be in these supports?

FROM ANALYSIS TO ACTION

- Consider repeating these analyses by institution or disaggregating by student demographic characteristics.
- Test different re-enrollment messaging campaigns based on how long students have been absent.
- Explore, design, and test interventions aimed specifically at meeting the unique needs of returning students.

SECTION 4

EARNING A LIVING WAGE

CONTENTS

GOALS AND PURPOSE

The final section of this Diagnostic will provide decision makers with critical information about which educational pathways provide livable wages and for whom. In this section, we show how to use wage data for state high school graduates to explore earnings across educational attainment and student background characteristics. Further, we provide benchmark wages against living wage thresholds to better understand who is earning enough to meet basic needs. In this final section, we answer the following question:

ANALYSIS QUESTION

A. How do earnings vary by educational attainment and student characteristics?

EDUCATION TO WORKFORCE PATHWAYS DIAGNOSTIC

Section 4: Earning a Living Wage

IN THIS SECTION:

Diagnostic Question 4.A: How do earnings vary by educational attainment and student characteristics?

DIAGNOSTIC CHART 4.A.1: Mean Wages by Highest Degree 10 years after High School Graduation Benchmarked Against the Living Wage Threshold

PURPOSE

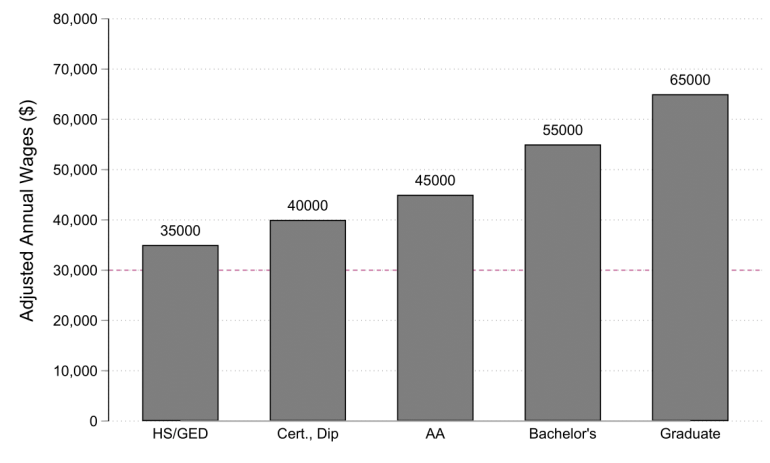
Decades of research have demonstrated that students with college degrees generally earn more than those who have not attended college (4-8). You can examine earnings in the context of your state by graphing mean wages by highest credential earned 10 years after high school graduation benchmarked against the statewide average living wage.

Benchmarking in this way provides helpful context to understand whether average earnings are enough for workers to live comfortably and provide for their families; however, there is likely variation in what a living wage is by locale within your state as well as in average wages among graduates from different institutions and programs. You can extend these analyses to explore these nuances.

ANALYTIC TECHNIQUE

Calculate mean earnings for students with three or more wage quarters present 10 years from high school by highest credential earned.

Diagnostic Chart 4.A.1: Mean Wages by Highest Degree 10 years After High School Graduation Benchmarked Against the Statewide Average Living Wage



UNDERSTANDING THE CHART

Diagnostic Chart 4.A.1 shows mean earnings for a given cohort of high school graduates 10 years after graduation broken down by degree type.

Each bar represents a different credential type, and the vertical axis represents mean earnings. Finally, the red line denotes the living wage average for the state.[a]
Here, we see that graduates with bachelor's and graduate degrees experience the largest earnings premiums.

a. Here, we use the living wage threshold for a single adult with no dependents. This decision is discussed in the technical guide.

ASK YOUR TEAM

- How large is the difference between the average earnings of college educated workers and high school graduates in your state?
- Are some college-educated workers earning close to the amount they would be earning had they stopped their education at high school graduation?
- How comprehensive is the wage data used for this analysis, and what questions cannot be answered with these data? †

FROM ANALYSIS TO ACTION

- Examine earnings at different time points, such as five and eight years from high school.
- Examine median earnings and compare to mean earnings to ensure outliers are not influencing results.
- Explore variation in living wage estimates across regions and urbanicities in your state.

† See the technical guide for a discussion of wage data and potential issues arising from missingness.

DIAGNOSTIC CHART 4.A.2: Distribution of Wages by Highest Degree 10 years After High School Graduation Benchmarked Against the Living Wage Threshold

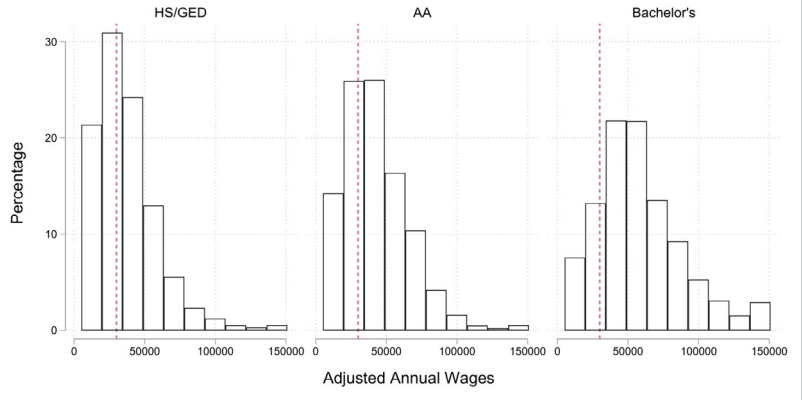
PURPOSE

The purpose of this analysis is to showcase the distribution of earners, by highest degree, around the living wage threshold. In other words, this chart will show states what proportion of degree holders earn above and below the state's average living wage threshold after having time to accumulate both an educational credential and work experience.

ANALYTIC TECHNIQUE

Generate bins for wages (here we create 10 bins), then calculate the percentage of earners who fall into each bin.

Diagnostic Chart 4.A.2: Distribution of Wages by Highest Degree 10 years After High School Graduation Benchmarked Against the Statewide Average Living Wage



UNDERSTANDING THE CHART

Diagnostic Chart 4.A.2 shows the percentage of earners (high school graduates from a given class 10 years after graduation) who fall into each wage bin broken down by highest degree type.

Each histogram shows the wage distribution for a particular credential type. Each bar contains students who fall into a particular wage bin. The horizontal axis shows the range of wages represented by each bar. The vertical axis shows the percentage of students who fall into each wage bin. Finally, the red line denotes the state's average living wage threshold.

When interpreting this chart, you should pay attention to the height of the bars, which indicate that more students fall into that particular wage bin, as well as where the tall bars are situated in respect to the living wage threshold. We see in the example chart below that over 50% of workers with only a high school diploma earned less than the living wage threshold in the state.

ASK YOUR TEAM

- Do most earners with a particular credential type fall above or below the living wage threshold?

FROM ANALYSIS TO ACTION

- Examine earnings at different time points, such as five and eight years from high school.

DIAGNOSTIC CHART 4.A.3: Mean Wages by Highest Degree and Demographic Characteristics/Program of Study 10 years After High School Graduation Benchmarked Against the Living Wage Threshold

PURPOSE

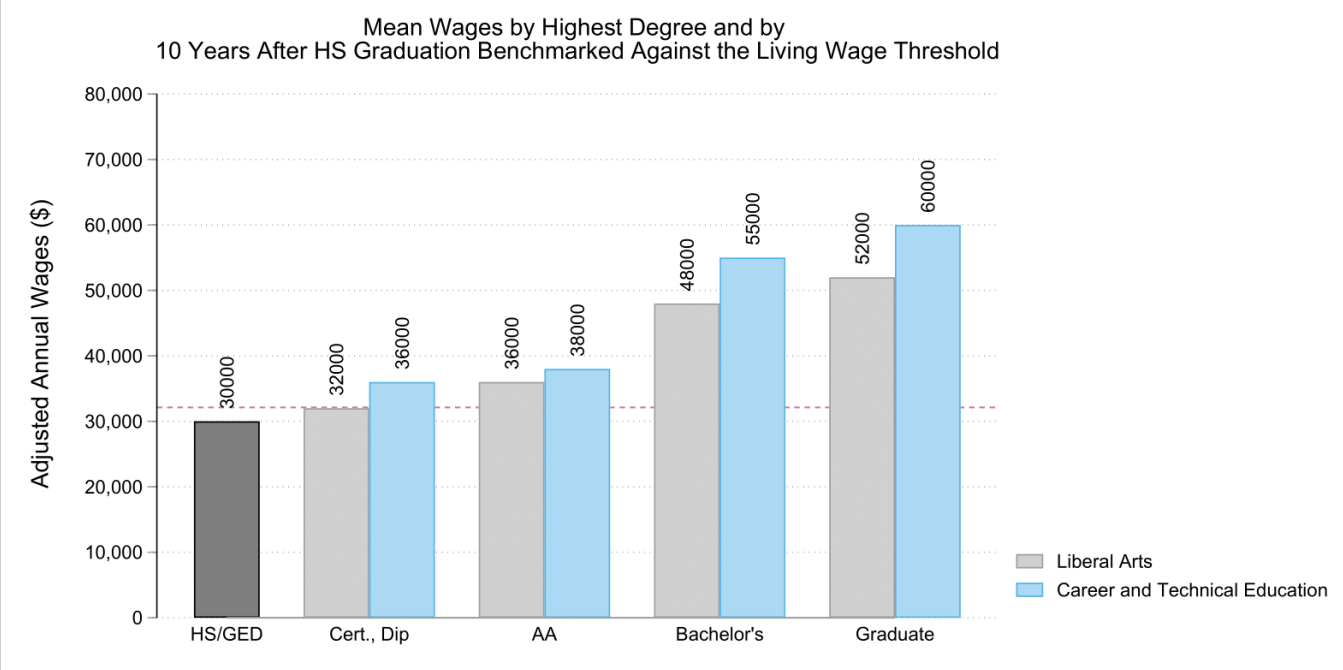
This analysis helps states understand which students are more likely to experience high earnings within degree type. You may find, after completing other analyses throughout this Diagnostic, that students with certain demographic and academic backgrounds were more likely to enroll in and complete college than others. Prior research also suggests that certain groups systematically earn less than others, regardless of degree type. Other work shows that student choice of major has a relationship with earnings (4-8, 12-13, 42).

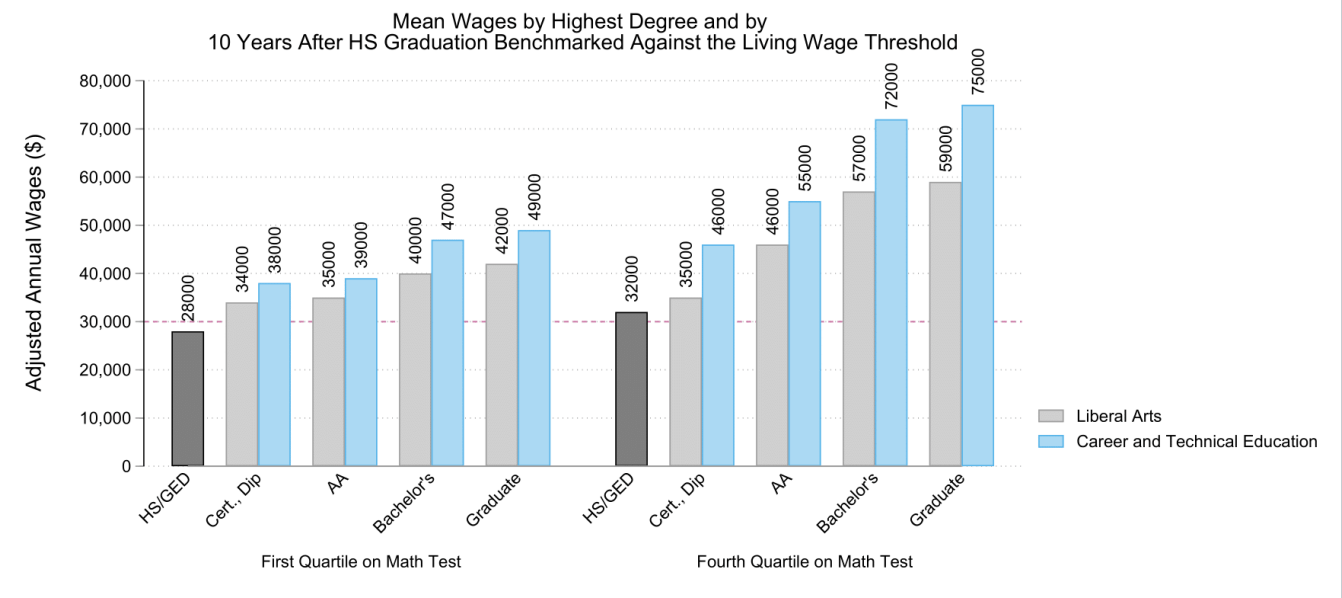
This analysis presents raw earnings by student group and degree type alongside earnings for these same groups accounting for prior academic achievement in high school. We account for prior achievement because it is possible that the raw earnings we observe are due more to the composition of students graduating with the credential than the credential itself. For example, it is possible that higher achieving students, who would likely earn more anyway due to access to resources, are selecting into certain degree pathways, which may drive up estimates of wages. By accounting for prior achievement, we can more narrowly explore the relationship between degree type and wages.

ANALYTIC TECHNIQUE

Plot mean wages by highest credential, test score quartile, and demographic/academic characteristics.

Diagnostic Chart 4.A.3: Mean Wages by Highest Degree and Demographic Characteristics/Program of Study 10 years After HS Graduation Benchmarked Against the Living Wage Threshold





UNDERSTANDING THE CHART

Diagnostic Chart 4.A.3 plots mean wages by broad field of study (career and technical vs liberal arts) and highest credential, both overall and by high school standardized test score quartile. Each bar corresponds to a field of study and the group of bars corresponds to a particular degree type (labeled on the horizontal axis). The vertical axis notes mean wages.

In the second plot, we calculate wages within broad field and credential type for those in the first and fourth quartiles. Finally, the red line denotes the statewide average living wage.

The useful information is, first, in comparing how earnings vary by subgroup within and across credential type. You may find that one group earns less regardless of credential type, and that the earnings gap widens as educational attainment increases.

You may also pay attention to how earnings shift—or stay the same—after accounting for prior academic achievement. If the earnings remain largely unchanged across test score groups, this is evidence that prior achievement is less predictive of a student's later earnings. A large shift in wages when accounting for test score suggests that the selection of students into the pathway is explaining some of the observed wage premium (or lack thereof).

In the first example chart, we see that those with CTE credentials generally earn more, and that the premium to a CTE relative to a liberal arts degree rises at higher credential levels, increasing from just over $4,000 (12%) for workers with a certificate or diploma, to almost $8,000 (15%) for workers with a graduate degree.

The second plot shows the pronounced CTE premium for workers with a math test score in the fourth quartile. For example, workers with a fourth quartile math test score who earned a CTE bachelor's or

graduate degree earned on average 26 and 27 percent more than fourth quartile math test scorers with a liberal arts bachelor's or graduate degree, respectively. By contrast, workers with a first quartile math test score who had a CTE bachelor's or graduate degree earned 18 and 17 percent more than first quartile math test scorers with a liberal arts bachelor's or graduate degree, respectively.
By looking at wages by test score quartile, we can see that the rising CTE premiums across higher credential types reflects is largely driven by earnings of individuals with a test score in the fourth quartile.

ASK YOUR TEAM

- Do certain students face barriers to financial security despite obtaining similar credentials as their peers?
- How are workforce development programs structured and targeted to support lower earning workers?
- How do the labor market needs in your state compare to the degree and field of study types with high premiums?

FROM ANALYSIS TO ACTION

- Examine earnings at different time points, such as five and eight years from high school.
- Examine median earnings and compare to mean earnings to ensure outliers are not influencing results.
- Consider disaggregating analyses by narrow field of study, student race/ethnicity, gender/sex, and prior socioeconomic status.

SDP EDUCATION AND WORKFORCE DIAGNOSTIC

Conclusion

The analyses presented in this Diagnostic may demonstrate that there are disparities in credential attainment across students' academic, demographic, and school characteristics. In your state, these attainment rates may be driven by low college entry rates, low completion rates, or both. We hope that these findings provide information on your state's progress toward education attainment goals and spark further discussion about how to improve college access and success.

Based on the results of these analyses, we encourage you to consult prior research for evidence-based practices that may help improve college attendance, persistence, and completion. We highlight a few of these practices here.

Target Outcome	Education Sector	Intervention	Level of Evidence†
College Attendance	K-12	Financial aid advising and hands-on FAFSA assistance to decrease financial aid barriers to enrollment (45).	Moderate Evidence
		Enhanced college advising in high schools aimed to help students find the right college fit for their goals (45).	Moderate Evidence
		Target students' academic preparation to increase college-going through high-impact tutoring (45-48).	Minimal to Moderate Evidence
		Target students' academic preparation to increase college-going through out-of-school programs (49-50).	Minimal to Moderate Evidence

† Level of evidence based off the Institute of Education Sciences' levels of evidence for practice guides. "In general, characterization of the evidence for a recommendation as strong requires both studies with high internal validity (i.e., studies whose designs can support causal conclusions) and studies with high external validity (i.e., studies that in total include enough of the range of participants and settings on which the recommendation is focused to support the conclusion that the results can be generalized to those participants and settings). In general, characterization of the evidence for a recommendation as moderate requires studies with high internal validity but moderate external validity or studies with high external validity but moderate internal validity. In other words, moderate evidence is derived from studies that support strong causal conclusions but generalization is uncertain or studies that support the generality of a relationship but the causality is uncertain. In general, characterization of the evidence for a recommendation as low means that the recommendation is based on expert opinion derived from strong findings or theories in related areas and/or expert opinion buttressed by direct evidence that does not rise to the moderate or strong level. Low evidence is operationalized as evidence not meeting the standards for the moderate or strong level." (https://ies.ed.gov/ncee/wwc/Docs/Multimedia/wwc_pg_loe_022718.pdf)

Target Outcome	Education Sector	Intervention	Level of Evidence†
Post-secondary Persistence and Completion	K-12	Early college/dual enrollment program participation (55, 56).	Strong Evidence
		Personalized college advising in high schools (57).	Moderate Evidence
	Postsec-ondary	Co-requisite support in which students receive develop-mental education support alongside their coursework (51, 52).	Strong Evidence
		Comprehensive, integrated advising that connects stu-dents to individualized academic and nonacademic supports (53, 54).	Moderate Evidence

Your analysis of wages may also show a great deal of variation in earnings both by student background and field of study, suggesting that the return to college is not the same for every student. Efforts to increase the number of college-educated workers in certain fields may require a closer look into the costs of these credentials.

Additionally, wage gaps within a credential type suggest a need for further analyses into the workforce outcomes of lower-earning students. In particular, prior work has shown that wage gaps can be attributed to both opportunity gaps, where certain workers are less likely hold management positions, as well as occupational segregation where some are more likely to work in industries that generally pay less (13). Further inquiry into the types of positions workers hold and their industries may reveal policy and practice solutions that will help ameliorate wage gaps.

Ultimately, the goal of this Diagnostic is to provide insights that beget more strategic questions. Improving student educational outcomes and meeting your state's labor market needs will take collective effort from policymakers, leaders across educational sectors, educators, and staff, and students and their families. By leveraging data, the insights from this Diagnostic, and ancillary analyses tailored to your context, you will be well-positioned to motivate that effort and effectively participate in the actions and innovations that result.

Appendix A

Table 1: Outcomes and Associated Literature Mapped to Education-to-Workforce Framework Indicators

Outcome	Associated Literature	Education-to-Workforce Framework Indicator
Postsecondary enrollment within one year of HS graduation	1. Roksa, J. & Velez, M. (2012) A Late Start: Delayed Entry, Life Course Transitions and Bachelor's Degree Completion, Social Forces, 90(3), 769–794, https://academic.oup.com/sf/article/90/3/769/2235779 2. National Center for Education Statistics. (2019a). Table 302.20. Percentage of recent high school completers enrolled in college, by race/ethnicity: 1960 through 2018. Digest of Education Statistics. Institute of Education Sciences, U.S. Department of Education. https://nces.ed.gov/programs/digest/d19/tables/dt19_302.20.asp 3. Coca, V. M., Nagaoka, J., & Seekin, A. (2017). Patterns of two-year and four-year college enrollment among Chicago Public Schools graduates. University of Chicago Consortium on School Research. https://eric.ed.gov/?id=ED589667#:~:text=Nineteen%20percent%20of%202009%20CPS,year%20colleges%20within%20four%20years	Postsecondary enrollment directly after high school graduation
Postsecondary credential completion	4. U.S. Bureau of Labor Statistics. (2021). Earnings and employment rates by educational attainment, 2020. U.S. Department of Labor, Bureau of Labor Statistics. https://www.bls.gov/emp/chart-unemployment-earnings-education.htm 5. Jepsen, C., Troske, K., & Coomes, P. (2014). The labor-market returns to community college degrees, diplomas, and certificates. Journal of Labor Economics, 32(1), 95–121. https://doi.org/10.1086/671809 6. Oreopolous, P., & Petronijevic, U. (2013). Making college worth it: A review of research on the returns to higher education. National Bureau of Economic Research. https://www.nber.org/system/files/working_papers/w19053/w19053.pdf	Postsecondary certificate or degree completion; Graduate degree completion

Outcome	Associated Literature	Education-to-Workforce Framework Indicator
	7. Tamborini, C. R., Kim, C. H., & Sakamoto, A. (2015). Education and lifetime earnings in the United States. Demography, 52(4), 1383–1407. https://dx.doi.org/10.1007%2Fs13524-015-0407-0 8. Altonji, J. G., & Zhong, L. (2016). The labor market returns to advanced degrees. Journal of Labor Economics, 39(2), 303–360. https://www.journals.uchicago.edu/doi/full/10.1086/710959	
College stop out	9. National Student Clearinghouse (2023). Some college, no credential student outcomes. https://nscresearchcenter.org/wp-content/uploads/SCNCReport2023.pdf 10. National Student Clearinghouse (2022). National college progression rates. /https://nscresearchcenter.org/wp-content/uploads/2022_HSBenchmarksReport.pdf	Postsecondary persistence
Earnings above a living wage	11. Nadeau, C. A. (2020). New living wage data for now available on the tool. Living Wage Calculator. https://livingwage.mit.edu/articles/61-new-living-wage-data-for-now-available-on-the-tool 12. Carnevale, A. P., Strohl, J., Gulish, A., Van Der Werf, M., & Campbell, K. P. (2019). The unequal race for good jobs: How Whites made outsized gains in education and good jobs compared to Blacks and Latinos. Center on Education and the Workforce, Georgetown University. https://eric.ed.gov/?id=ED600048 13. Zhavoronkova, M., Khattar, R., & Brady, M. (2022). Occupational segregation in America. Center for American Progress. https://www.americanprogress.org/article/occupational-segregation-in-america/	Access to jobs paying a living wage

Appendix B

Table 2: Disaggregation and Associated Literature Mapped to Education-to-Workforce Framework Indicator

Background Characteristic or Prior Experience	Definition	Associated Literature	Education- to-Workforce Framework Indicator/ Disaggregate
Race/ ethnicity	Student race/ ethnicity	14. Belley, P., & Lochner, L. (2007). The changing role of family income and ability in determining educational achievement. Journal of Human Capital, 1(1), 37–89. https://doi.org/10.1086/524674 15. Chetty, R., Friedman, J., Saez, E., Turner, N., & Yagan, D. (2017). Mobility report cards: The role of colleges in intergenerational mobility. National Bureau of Economic Research. https://www.nber.org/papers/w23618 16. National Center for Education Statistics. (2019a). Table 302.20. Percentage of recent high school completers enrolled in college, by race/ethnicity: 1960 through 2018. Digest of Education Statistics. Institute of Education Sciences, U.S. Department of Education. https://nces.ed.gov/programs/digest/d19/tables/dt19_302.20.asp 17. Coca, V. M., Nagaoka, J., & Seekin, A. (2017). Patterns of two-year and four-year college enrollment among Chicago Public Schools graduates. University of Chicago Consortium on School Research. https://eric.ed.gov/?id=ED589667#:~:text=Nineteen%20percent%20of%202009%20CPS,year%20colleges%20within%20four%20years.	Race/Ethnicity

Background Characteristic or Prior Experience	Definition	Associated Literature	Education- to-Workforce Framework Indicator/ Disaggregate
Sex	Student sex	18. Reeves, R. V., & Smith, E. (2021). The male college crisis is not just in enrollment, but completion. Brookings Institute. https://www.brookings.edu/blog/up-front/2021/10/08/the-male-college-crisis-is-not-just-in-enrollment-but-completion/	Gender
Free and Reduced-Price Lunch Receipt	Whether a student received FRPL while in HS	19. National Center for Education Statistics. (2015). Educational attainment differences by students' socioeconomic status. Condition of Education. https://nces.ed.gov/programs/coe/pdf/coe_tva.pdf 20. National Student Clearinghouse. (2017). High school benchmarks 2017: National college progression rates. https://nscresearchcenter.org/hsbenchmarks2017/	Income Level
Discipline Record	Whether a student was involved in disciplinary action in HS	21. Skiba, R., & Karega Rausch, M. (2004). The relationship between achievement, discipline, and race: An analysis of factors predicting ISTEP scores. Children left behind policy briefs. Supplementary analysis 2-D. Center for Evaluation and Education Policy, Indiana University. https://eric.ed.gov/?id=ED488899 22. Balfanz, R., Byrnes, V., & Fox, J. (2014). Sent home and put off-track: The antecedents, disproportionalities, and consequences of being suspended in the ninth grade. Journal of Applied Research on Children, 5(2), article 13. https://digitalcommons.library.tmc.edu/childrenatrisk/vol5/iss2/13/	Positive behavior

Background Characteristic or Prior Experience	Definition	Associated Literature	Education- to-Workforce Framework Indicator/ Disaggregate
Advanced Course Enrollment	Whether a student took advanced coursework in HS (AP, IB, dual/joint enrollment)	23. Shields, K. A., Bailey, J., Hanita, M., & Zhang, X. (2021). The effects of accelerated college credit programs on educational attainment in Rhode Island. Regional Educational Laboratory, Northeast & Islands. Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/rel/Project/5680 24. Cumpton, G., Schexnayder, D., King, C. T., & Stolp, C. (2012). Factors associated with education and work after high school for the classes of 2008 and 2009: A research report of the Central Texas Student Futures project. Ray Marshall Center for the Study of Human Resources, University of Texas at Austin. http://hdl.handle.net/2152/20410 25. Warne, R. T. (2017). Research on the academic benefits of the advanced placement program: Taking stock and looking forward. SAGE Journals, 7(1). https://doi.org/10.1177/2158244016682996	Early college coursework completion
HS standardized test scores	Quartile for student score on standardized tests	26. Duncan, G. J., Claessens, A., Huston, A. C., Pagani, L. S., Engel, M., Sexton, H., Dowsett, C. J., Magnuson, K., Klevanov, P., Feinstein, L., Brooks-Gunn, J., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. Developmental Psychology, 43(6), 1428–1446. https://doi.org/10.1037/0012-1649.43.6.1428 27. The Nation's Report Card. (2019e). NAEP report card: Reading. National student group scores and score gaps. https://www.nationsreportcard.gov/reading/nation/groups/?grade=12	Math and Reading proficiency in HS

Background Characteristic or Prior Experience	Definition	Associated Literature	Education- to-Workforce Framework Indicator/ Disaggregate
Performance on 8th Grade ELA and Math Tests	Student proficiency level on the 8th grade ELA and Math tests.	28. Cumpton, G., Schexnayder, D., King, C. T., & Stolp, C. (2012). Factors associated with education and work after high school for the classes of 2008 and 2009: A research report of the Central Texas Student Futures project. Ray Marshall Center for the Study of Human Resources, University of Texas at Austin. http://hdl.handle.net/2152/20410 29. The Nation's Report Card. (2019). NAEP report card: Mathematics. https://www.nationsreportcard.gov/highlights/mathematics/2019/ 30. The Nation's Report Card. (2019). NAEP report card: Reading. https://www.nationsreportcard.gov/highlights/reading/2019/	Math and reading proficiency in 8th grade
Course Failure in 9th Grade Core Courses	Whether a student failed one or more core course in 9th grade (math, English, social studies, science)	31. Allensworth, E. M., & Easton, J. Q. (2007). What matters for staying on-track and graduating in Chicago public high schools: A close look at course grades, failures, and attendance in the freshman year. Consortium on Chicago School Research at the University of Chicago. https://consortium.uchicago.edu/sites/default/files/2018-10/07%20What%20Matters%20Final.pdf	9th grade on track
9th Grade Core Course GPA	Student GPA in 9th grade core courses (math, English, social studies, science)	32. Easton, J. Q., Johnson, E., & Sartain, L. (2017). The predictive power of ninth-grade GPA. University of Chicago. https://consortium.uchicago.edu/publications/predictive-power-ninth-grade-gpa	9th grade on track, grade point average

Background Characteristic or Prior Experience	Definition	Associated Literature	Education- to-Workforce Framework Indicator/ Disaggregate
Chronic Absenteeism in 9th Grade	Whether a student was absent more than 10% of enrolled days in 9th grade.	33. Allensworth, E. M., & Easton, J. Q. (2007). What matters for staying on-track and graduating in Chicago public high schools: A close look at course grades, failures, and attendance in the freshman year. Consortium on Chicago School Research at the University of Chicago. https://consortium.uchicago.edu/sites/default/files/2018-10/07%20What%20Matters%20Final.pdf	Consistent attendance
% in School Receiving FRPL	Percent of students enrolled in high school receiving FRPL.	34. National Student Clearinghouse (2022). High School Benchmarks. https://nscresearchcenter.org/wp-content/uploads/2022_HSBenchmarksReport.pdf	School socioeconomic diversity
HS Locale	Locale of HS (rural, town, urban, suburban)	35. Croft, M., & Moore, R. (2019). Rural students: Technology, coursework, and extracurricular activities. ACT Center for Equity in Learning. https://eric.ed.gov/?id=ED596140 1350 36. National Center for Education Statistics. (n.d.). Rural education in America. Institute of Education Sciences, U.S. Department of Education, https://nces.ed.gov/surveys/ruraled/definitions.asp#:~:text=Urbanized%20areas%20and%20urban%20clusters,are%20designated%20as%20urban%20clusters 37. National Center for Education Statistics. (2023). The Condition of Education 2023. https://nces.ed.gov/programs/coe/pdf/2022/lbc_508.pdf 38. United States Department of Agriculture (2022). Educational attainment improved in rural America but educational gap with urban areas grew for bachelor's degrees and higher. https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=106147#:~:text=In%202017%E2%80%9321%2C%20the%20share,22%20percent%20in%20rural%20areas.	Urbanicity

Background Characteristic or Prior Experience	Definition	Associated Literature	Education- to-Workforce Framework Indicator/ Disaggregate
Credit accumulation	Credits accumulated in the first term and at the time of stop out	39. Adelman, C. (2006). The toolbox revisited: Paths of degree completion from high school through college. U.S. Department of Education. https://www2.ed.gov/rschstat/research/pubs/toolboxrevisit/toolbox.pdf 40. Attewell, P., & Monaghan, D. (2016). How many credits should an undergraduate take? Research in Higher Education, 57, 682–713. https://doi.org/10.1007/s11162-015-9401-z 41. Belfield, C., Jenkins, D., & Lahr, H. (2016). Momentum: The academic and economic value of a 15-credit first semester course load for college students in Tennessee. Community College Research Center. http://ccrc.tc.columbia.edu/media/k2/attachments/momentum-15-credit-course-load.pdf	First-year credit accumulation

Appendix C

Table 3: Additional Literature

Citation	Topic
42. Ma, J. & Pender, M. (2023) Education pays 2023: The benefits of higher education for individuals and society. https://research.collegeboard.org/media/pdf/education-pays-2023.pdf	Returns to college
43. National Center for Education Statistics. (2023). Immediate College Enrollment Rate. Condition of Education. U.S. Department of Education, Institute of Education Sciences. Retrieved March 24, 2023, from https://nces.ed.gov/programs/coe/indicator/cpa.	College enrollment rate
44. Mathematica (2023) Educator-to-Workforce Framework. https://www.mathematica.org/projects/education-to-workforce-indicator-framework	Educator-to-Workforce Framework
45. What Works Clearinghouse (WWC). (2009d). Helping students navigate the path to college: What high schools can do. Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/wwc/PracticeGuide/11	Interventions related to postsecondary enrollment
46. What Works Clearinghouse (WWC). (2009a). Assisting students struggling with reading: Response to Intervention (RTI) and multi-tier intervention in the primary grades. Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/wwc/PracticeGuide/3 47. What Works Clearinghouse (WWC). (2009b). Assisting students struggling with mathematics: Response to Intervention (RTI) for elementary and middle schools. Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/wwc/practiceguide/2 48. What Works Clearinghouse (WWC). (2008). Improving adolescent literacy: Effective classroom and intervention practices. Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/wwc/PracticeGuide/8 49. Heinrich, C. J., Burch, P., Good, A., Acosta, R., Cheng, H., Dillender, M., Kirshbaum, C., Nisar, H., & Stewart, M. (2014). Improving the implementation and effectiveness of out-of-school-time tutoring. Journal of policy analysis and management, 33(2), 471–494. https://doi.org/10.1002/pam.21745 50. What Works Clearinghouse (WWC). (2009c). Structuring out-of-school time to improve academic achievement. Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee/wwc/PracticeGuide/10	Interventions related to postsecondary completion

Citation	Topic
51. Smith Jaggars, S., Hodara, M., Cho, S. W., & Xu, D. (2014). Three accelerated developmental education programs: Features, student outcomes, and implications. Community College Review, 43(1). https://ccrc.tc.columbia.edu/publications/three-accelerated-developmental-education-programs.html 52. What Works Clearinghouse, Institute of Education Sciences, U.S. Department of Education. (2021, June). Dana Center Mathematics Pathways. https://whatworks.ed.gov. 53. Alamuddin, R., Rossman, D., & Kurzweil, M. (2018). Monitoring advising analytics to promote success (MAAPS): Evaluating findings from the first year of implementation. Ithaka S+R. https://doi.org/10.18665/sr.307005 54. 5 Bettinger, E. P., & Baker, R. (2014). The effects of student coaching an evaluation of a randomized experiment in student advising. Educational Evaluation and Policy Analysis, 36(1), 3–19. https://doi.org/10.3102/0162373713500523 55. Shields, K. A., Bailey, J., Hanita, M., & Zhang, X. (2021). The effects of accelerated college credit programs on educational attainment in Rhode Island. U.S. Department of Education, Institute of Education Sciences, Regional Educational Laboratory Northeast & Islands. https://ies.ed.gov/ncee/rel/Project/5680 56. Edmunds, J. A., Unlu, F., Glennie, E., Bernstein, L., Fesler, L., Furey, J., & Arshavsky, N. (2017). Smoothing the transition to postsecondary education: The impact of the early college model. Journal of Research on Educational Effectiveness, 10(2), 297–325. https://eric.ed.gov/?id=EJ1135800 57. Barr, A., & Castleman, B. (2021). The bottom line on college advising: Large increases in degree attainment. EdWorking Papers, Brown University. https://www.edworkingpapers.com/ai21-481	Interventions related to postsecondary completion

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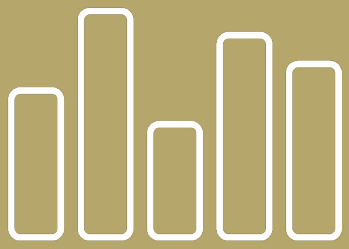

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