High School Indicators Of Postsecondary Success

Research Report No. 451

Office Of Education Accountability

Kentucky Legislative Research Commission

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High School Indicators Of Postsecondary Success

Project Staff

Deborah Nelson, PhD
Albert Alexander
Chris Riley
Sabrina J. Olds
Logan Rupard
Christopher B. Joffrion
Bart Liguori, PhD

Bart Liguori, PhD
Research Division Manager

David Wickersham
Deputy Director for the Office of Education Accountability

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Foreword

For more than 25 years, the Office of Education Accountability (OEA) has played an important role in reporting on education reform in the Commonwealth of Kentucky. Today, the employees of OEA strive to provide fair and equitable accountability, documenting the challenges and opportunities confronting Kentucky's education system.

In November 2016, the Education Assessment and Accountability Review Subcommittee (EAARS) approved the OEA 2017 study agenda, which included this report. This study examines high school indicators and their association with measures of postsecondary success. It represents an important extension of OEA's statutorily defined duty to, under the direction of EAARS, validate the state assessment program through other external indicators of academic progress.

The Office of Education Accountability would like to thank staff at the Kentucky Center for Education and Workforce Statistics and the Kentucky Department of Corrections for their assistance with this report.

The Legislative Research Commission comprises more than 400 professionals who work to make the legislative process accessible, informative, and relevant to the citizens of the commonwealth. OEA is an important part of that mission. Thank you for your interest in this report.

David A. Byerman
Director

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Summary

In the last decade, education policies in Kentucky have focused on strengthening the connection between what students learn in high school and what they will need to be successful in college and in the workforce. The Kentucky Department of Education (KDE) reports high school graduates' outcomes through college- and career-readiness measures, but graduates' long-term outcomes, based on these measures, are not fully known. This study takes advantage of a unique, nationally recognized data set from the Kentucky Center for Education and Workforce Statistics to track students for up to 6 years following high school graduation, looking at the relationship between high school indicators and students' success in college and in the workforce. In addition to college- and career-readiness measures, the study analyzes students' grade point average (GPA), attendance, and disciplinary data.

The study reports outcomes for graduates pursuing postsecondary education as well as those who enter the workforce without earning a postsecondary degree. Kentucky lags the nation considerably in the percentage of adults with associate's degrees or above (31 percent versus 43 percent). Degree attainment is important for the economic outcomes of individual graduates and may also determine the state's ability to attract higher-paying industries. By even the most aggressive estimates, however, at least one-third of future jobs will not require any postsecondary education. It is therefore important to understand not only how high school indicators predict degree attainment for college-going graduates, but how they predict wages for graduates who enter the workforce without earning a postsecondary degree.

The study finds that the relative importance of college- and career-readiness measures differs substantially for graduates who pursue postsecondary education versus those who enter the workforce without earning a postsecondary degree. College readiness as demonstrated on the ACT in 11th grade is a strong predictor of college success. Kentucky regulation focuses on remediating students in the senior year if they are not college ready, but remediation at that point may not be adequate to prepare them for college. In contrast, college readiness has relatively little impact on wages of students who work in jobs that do not require a postsecondary degree. For nondegreed workers, career and technical education (CTE) is associated with substantially higher wages, even 6 years after high school graduation. CTE wage premiums are greatest for the academically lowest-achieving students (those who earn 14 or less on the ACT), yet only about one-third of academically lower-achieving graduates complete CTE preparation. In addition, black graduates are about half as likely as white graduates to complete CTE preparation.

Indicators that appear to reflect positive engagement and work habits—such as GPA, attendance, and lack of serious disciplinary incidents—are associated with successful outcomes both for graduates enrolling in college and for those who enter the workforce directly. These findings reflect national research indicating that students' social and emotional characteristics, in addition to their academic ability as measured by standardized tests, are important for future success. Specific findings related to graduates pursuing postsecondary degrees versus those entering the workforce directly are discussed below.

High School Indicators Of Success In Postsecondary Education

Beginning in 2012, KDE allowed high school graduates to demonstrate college readiness by meeting benchmarks established by the Kentucky Council on Postsecondary Education (CPE) on one of several measures: the ACT test, which had been administered to all 11th-graders since 2008, or two college placements tests—Compass and Kentucky Online Testing (KYOTE). This study finds that college readiness on the ACT predicts college graduation, whereas readiness on the placement tests alone may not. Graduates from the class of 2010 who met CPE's ACT college readiness benchmarks or graduates who had a grade point average of 3.5 or above were likely to earn an associate's degree or higher within 6 years. Although degree-earning rates are not yet available for 2012 graduates (those who were permitted to demonstrate readiness on college placement tests, in addition to the ACT), preliminary evidence suggests that graduates who demonstrate readiness primarily on Compass and KYOTE are much less likely to earn a degree than those who demonstrate readiness on the ACT. For example, 2015 graduates who were college ready exclusively on these placement tests had much lower first-semester college GPAs than those who demonstrated readiness on the ACT, and they performed no better in college than graduates who were not college ready. Because of the reduced likelihood of college graduation for students demonstrating college-readiness status exclusively through college placements tests, OEA recommends the following:

Recommendation 2.1
In its reporting of college-readiness measures on state, district, and school report cards, the Kentucky Department of Education should indicate the number and percentage of students who are considered college ready because they met benchmarks in each of the required subject areas of reading, English, and math on the ACT; those who are college ready on a combination of ACT tests and placement tests approved by the Council on Postsecondary Education (CPE); and those who are college ready on CPE-approved placement tests alone.

CPE currently reports graduation rates and college-readiness rates for all of Kentucky's 2- and 4-year institutions. Students can be deemed college ready through a variety of indicators. To evaluate the validity of particular college-readiness measures, policy makers must know the graduation rates of students deemed college ready by particular indicators.

Recommendation 2.2
The Kentucky Department of Education should provide to the Kentucky Center for Education and Workforce Statistics data that indicate whether students were considered college ready because they met benchmarks in each of the required subject areas of reading, English, and math on the ACT; met benchmarks on a combination of ACT tests and placement tests approved by the Council on Postsecondary Education (CPE); or met benchmarks on CPE-approved placement tests alone.

This study shows that, by 2016, just over one-quarter of the class of 2010 had earned an associate's degree or above. Although this rate is approaching the level currently demanded for Kentucky's workforce, it is insufficient to close the gap in degree attainment between Kentucky and the nation. For policy makers seeking to increase the rate at which Kentucky's high school graduates earn degrees, this study offers two areas to consider.

First, Kentucky students from lower-income families—those who qualify for the federal free or reduced-priced lunch program (FRPL)—are earning degrees at a rate that is considerably lower than that of their non-FRPL peers with similar achievement; this gap between FRPL and non-FRPL students exists even for students with very high ACT scores. If FRPL 2010 graduates had enrolled and graduated from college at the same rates as their similarly qualified non-FRPL peers, the total number of graduates would have increased by over 2,300, boosting the degree attainment rate for the class of 2010 by almost 20 percent. The lower college graduation rates for FRPL students have consequences for individual students and for the state; the potential additional 2,300 FRPL college graduates from the class of 2010 might have generated approximately $13 million in additional wages in FY 2016.

Second, Kentucky policy currently focuses on the senior year to identify and remediate students who are not ready for college, but that point seems to be too late to fully prepare high school graduates for college. Students with the interest in or potential ability to earn a college degree should be identified prior to high school and provided the necessary support and incentives to focus on college readiness during their high school years.

High School Indicators Of Success For Graduates Working With No Postsecondary Degree

For students entering the workforce directly, higher wages are associated more with CTE preparation, attendance, and grades than with higher ACT scores. Even 6 years after high school graduation, CTE completers from the class of 2010 were earning 18 percent more than noncompleting peers; preliminary evidence from 2015 graduates shows even higher premiums for those who met all of the criteria to be considered career ready. Good high school attendance and grades were also associated with higher wages for nondegreed workers. In contrast, there was little association between ACT scores and wages; average wages were not substantially greater for graduates with higher ACT scores than they were for those with below-average scores of 15 to 18.

Given the CTE wage premium for academically lowest-achieving students, it is important to understand why less than half of these students are completing CTE preparation. There may be reluctance among some educators or parents to focus on CTE education because it has been viewed in the past as an alternative to college; however, most 2010 graduates who completed CTE education were equally likely to complete college as their peers who did not complete CTE.

Examination Of High School Graduation Requirements

Taken together, findings related to degree-earning graduates versus workers without degrees indicate differences in priority considerations for the high school education of students who intend to pursue postsecondary education versus those who intend to enter the workforce directly. The new accountability system that KDE has proposed for implementation in the 2018-2019 school year provides a variety of ways to recognize graduates as successful in postsecondary transitions and to recognize schools for providing opportunities for success. In keeping with this goal, KDE should review the minimum graduation requirements described in 704 KAR 3:305 and examine whether the requirements allow schools and districts sufficient flexibility to meet the needs of students with different postsecondary goals. For example, the

requirements in sections 2(1)(b) and 2(3)(d) that students take transitional courses based on CPE college readiness benchmarks might be broadened to allow for transitional courses for students not meeting academic standards for career readiness. In addition, given strong evidence that students who directly enter the workforce benefit from a sequence of CTE classes, it is worth investigating whether the required course credits as currently described align well with the goal of providing CTE education.

Recommendation 3.1
The Kentucky Department of Education should examine the minimum high school graduation requirements outlined in 704 KAR 3:305, sec. 2 to determine whether those requirements offer local districts and schools sufficient flexibility to tailor high school programs to meet the needs of students with different postsecondary goals.

Limitations

Postsecondary degree and wage data have limitations as a means of determining the comprehensive relationships between high school indicators and postsecondary success. First, wage data do not capture outcomes for all students and in some cases provide insufficient detail (such as whether workers are full or part time, have moved out of state, or have exited the workforce) to understand relationships. Next, degree and wage data do not capture many of the capacities set as goals for K-12 education in KRS 158.645. These include qualities such as mental and physical wellness; appreciation of cultural and historical heritage; good character; understanding of governmental institutions; and ability to make economic, social, and political choices. Finally, social and economic factors appear to influence wages and degree attainment, beyond what high school indicators alone can explain. The difference in degree attainment between similarly qualified FRPL and non-FRPL students has already been mentioned. In addition, wages based on gender appear to vary more based on workforce sector than they do based on high school indicators. Thus, while the findings presented in this report represent an important step in determining the relationships between high school indicators and postsecondary outcomes, these findings will no doubt be amended as policy makers and researchers learn more about high school and postsecondary outcomes measures and the contextual factors that influence the relationships between the two.

Chapter 1

Introduction And Overview

Education reforms are taking place in the context of continuing state and national debates about the relationship between education and workforce demand.

Education policies in Kentucky and the nation have focused increasingly on preparing students to be successful in college and the workplace. Yet, there are continuing state and national debates about the evolving role of education in preparing workers for a global economy; the future demand for workers with different amounts of postsecondary education; and the relative importance of academic skills as measured by standardized tests versus soft skills such as personal communication, conscientiousness, and ability to work well with others.[1]

It is important to understand how high school indicators predict postsecondary success for graduates pursuing postsecondary education as well as for those who enter the workforce without a postsecondary degree.

Kentucky data and national data show that wages increase with level of education and that most of the highest-paying jobs demand some type of postsecondary education. For the benefit of individuals as well as the economic growth of the state, policy makers have pushed to increase college enrollment and graduation rates. At the same time, data show clearly that at least one-third of future jobs will not require any postsecondary education.[a] For this reason, it is important to understand how high school indicators predict postsecondary success for graduates pursuing postsecondary education as well as for those who enter the workforce without a postsecondary degree.

This study follows high school students from the class of 2010 and the class of 2015 as they pursue postsecondary degrees or enter the workforce.

This study uses data from the Kentucky Center for Education Workforce Statistics (KCEWS) to follow Kentucky high school students into postsecondary education and the workforce. The study focuses largely on students who graduated in 2010, along with students who were part of the graduating class but did not graduate from Kentucky public schools. The report looks at the association between student grades, standardized test scores, attendance, behavior, and career and technical education (CTE) and the education and workforce outcomes of the class of 2010 as they are available through the year 2016. The study also analyzes data from the class of 2015 to assess the outcomes of graduates identified with college- and career-readiness designations that the Kentucky Department of Education (KDE) implemented in 2012.

[a] Aggressive estimates are based on the reported credentials of employees holding jobs whereas estimates based on employers' reports of minimal qualifications for specific jobs are lower. For a discussion of these differences see, for example, Anthony Carnevale Nicole Smith, and Jeff Strohl. *Recovery: Job Growth And Education Requirements Through 2020.* Georgetown Univ.: Center on Educ. and the Workforce, June 2013, P. 7.

Description Of This Study

In November 2017, the Education Assessment and Accountability Review Subcommittee requested that the Office of Education Accountability examine high school indicators and their association with measures of postsecondary success. High school indicators included grades, attendance, and standardized test scores; measures of postsecondary success included postsecondary enrollment, postsecondary graduation, and workforce participation. The subcommittee also requested that the relationships between high school indicators and postsecondary outcomes be disaggregated by region and by student demographic group.

The study provides data relevant to many Kentucky Department of Education (KDE) program areas but is not intended as a review of any one area.

This study provides data that are relevant to many KDE program areas but is not intended as a comprehensive review of any one program or policy area. The study is intended, rather, as a means of exploring the validity of K-12 indicators as they relate to postsecondary outcomes that are commonly considered important goals of the primary and secondary education system.[b]

Data Used For The Report

Data for this study were obtained from the Kentucky Center for Education and Workforce Statistics (KCEWS), which links KDE data with data from a variety of state agencies.

Data analyzed for this report were obtained from KCEWS, which links education and workforce data from a variety of state agencies. Data obtained from KCEWS for this report included secondary education data from the Kentucky Department of Education, including students' scores on the ACT college readiness test, grade point averages (GPAs), attendance data, and discipline data; workforce data from the Kentucky Unemployment Insurance Claims System, including data on individual quarterly earnings and workforce sector of employment; postsecondary enrollment, graduation, major, and GPA data from the Kentucky Council on Postsecondary Education (CPE) and the National Student Clearinghouse; and data on incarceration type and length from the Kentucky Department of Corrections.

Class of 2010 and class of 2015 data include high school graduates as well as those who were enrolled in previous years with the graduating class. The study tracks outcomes through 2016.

The report analyzes data from two cohorts of students, as illustrated in Table 1.1: the graduating classes of 2010 and 2015. Each cohort includes students enrolled in the graduating year, along with any student who was ever part of that graduating class

[b] In this sense, the study builds on the statutory charge of OEA, under KRS 7.410, to, "under the direction of the Education Assessment and Accountability Review Subcommittee, conduct studies, analyze, verify, and validate the state assessment program through other external indicators of academic progress … and whether progress is being made toward attaining the goal of providing students with the seven (7) capacities as required by KRS 158.645."

going back through the last available year—the 11th grade for the class of 2010 and the 8th grade for the class of 2015. Students are included in the cohort regardless of whether they were enrolled every year of the class or whether they graduated. Each class is tracked for postsecondary years through 2016. The study focuses primarily on the graduating class of 2010 because this class can be followed for 6 years following graduation. Data from the graduating class of 2015 are used primarily to analyze college- and career-readiness designations that KDE implemented in 2012.

Table 1.1
Years And Grades Analyzed In Research Cohorts

	School Year								
Graduating Class	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
2010	10	11	12	PS-1	PS-2	PS-3	PS-4	PS-5	PS-6
2015	—	—	—	8	9	10	11	12	PS-1

Note: PS = postsecondary year; — = data not available.

The study is informed by the extensive analysis of postsecondary and workforce outcomes previously published by KCEWS.

The study is informed by the extensive analysis of postsecondary and workforce outcomes previously published by KCEWS. This analysis includes high school and postsecondary feedback reports and research briefs reporting workforce outcomes based on educational attainment.[c]

Limitations

Workforce data include about 90 percent of those employed in Kentucky but do not include those who are working in other states.

Available data do not capture the full range of workforce outcomes. They do not include data for those who are not employed in Kentucky; who are in the military; or who are self-employed, federally employed, or employed in agriculture or other sectors that do not report to the unemployment insurance system. KCEWS estimates that 90 percent of Kentucky workers are captured in wage data.[2]

Outcome data do not cover the range of outcomes affected by education.

In addition, outcome data are limited to postsecondary degrees, wage data, and incarceration rates and thus do not capture the range of outcomes affected by education. These include, in addition to workforce outcomes, personal health and social outcomes and outcomes that affect the civic health of communities.

Further, high school indicators analyzed for this study do not include many of the measures that have been hypothesized as links

[c] Reports are available on the KCEWS website at kcews.ky.gov/Reports/ViewReportsContentArea.

to postsecondary success, especially in the areas of social and emotional learning. These indicators—which could include participation in extracurricular activities, communication skills, and ability to solve problems or work cooperatively—are not available in large-scale data.

Organization Of The Report

The remainder of Chapter 1 describes broad education and workforce outcomes for the class of 2010. It compares the association between high school indicators and outcomes for students who enroll in college and for those who enter the workforce without postsecondary degrees.

Chapter 2 describes the relationships among high school indicators and postsecondary enrollment and degree completion. It identifies characteristics of students likely to earn a degree and compares indicators and degree-earning rates among student groups and geographic regions.

Chapter 3 describes the relationships among academic, career/technical, and behavioral indicators and 2016 wages for graduates who enter the workforce without earning a postsecondary degree or workforce certificate.

Major Conclusions

- Broad outcomes of the class of 2010 from graduation through 2016 varied substantially among student groups. Female students were more likely than male students to have earned a college degree, whereas male students who did not earn a degree were more likely to be working for a living wage. Homeless students were the least likely of all groups to have earned a college degree or work for above minimum wage, and they were incarcerated at about three times the rate of all students.

- By 2016, approximately 26 percent of the class of 2010 had earned an associate's degree or above. Although this rate is approaching the level required by Kentucky's current workforce demand, it is insufficient to close the substantial gap between the percentages of adults who have college degrees in Kentucky (31.2 percent) versus in the nation (42.3 percent).

- ACT scores and high school GPAs are both highly associated with earning a college degree. For example, 8 percent of

students with an ACT composite of 15 earned an associate's degree or above by 2016 versus 71 percent of students with a composite of 30. Of the students who scored a 30 on the ACT, those with a GPA of 3.5 or higher were five times as likely to earn a degree as were those with a GPA of 2.5 to 2.99 (85 percent versus 17 percent, respectively).

- Kentucky policies focus on the senior year of high school to remediate students who are not college ready on the 11th-grade ACT. Prior to high school graduation, many students who did not meet ACT college-readiness benchmarks demonstrate readiness on the Compass and Kentucky Online Testing (KYOTE) college placement tests. Graduates deemed college ready by Compass and KYOTE college placements tests alone appear much less likely to earn a degree than do graduates who demonstrate readiness on the ACT.

- Students who were eligible for the federal free or reduced-priced lunch (FRPL) program in high school earn degrees at substantially lower rates than their similarly qualified non-FRPL peers. If class of 2010 FRPL students had enrolled in college and graduated at the same rates as their similarly qualified non-FRPL peers, the total number of class of 2010 college graduates would be 20 percent greater. These additional FRPL graduates might have generated approximately $13 million in additional wages in 2016.

- Wages of graduates entering the workforce without a postsecondary degree are associated more strongly with CTE preparation and behavioral measures such as attendance or disciplinary incidents than they are with ACT scores. 2010 graduates who had completed CTE preparation earned an average of about $3,300 (or 18 percent) more in 2016 than high school graduates who had not. Preliminary data from the class of 2015 suggest that additional career-readiness measures (industry certificates and career-readiness academic skills) are associated with even greater wage premiums.

- CTE wage premiums vary by workforce sector and student characteristics: They are greater in industries such as construction and manufacturing than they are in food and accommodations; greater for students in the lowest achievement ranges—those with ACT scores of less than 15; and greater for male workers than female workers ($4,913 versus $828 for 2010 graduates). Female workers are more likely than male workers to be employed in lower-wage

industries such as food and accommodations or health care and social assistance.

- Despite the relatively higher CTE wage premium for the academically lowest-achieving students, only about one-third of these students complete CTE preparation. Black students are about half as likely as white students to complete CTE preparation.

Broad Education And Workforce Outcomes For Class Of 2010

Figures 1.A and 1.B show the broad educational and workforce outcomes for the class of 2010. They are calculated as a percentage of students who could be located in the postsecondary data as of 2016 and who were enrolled in the class as early as 10th grade, regardless of whether they graduated from high school. Figure 1.A reports outcomes for female and male students. Figure 1.B reports outcomes for FRPL students, non-FRPL students, and homeless students. Appendix A provides percentages associated with each outcome and includes additional broad outcome data based on student race, eligibility for special education individualized educational programs (IEPs), and limited English proficiency (LEP) status.[d]

In Figures 1.A and 1.B, outcomes reported above zero along the horizontal axis are considered positive: earning an associate's degree or above; not earning a postsecondary degree but earning the annual equivalent of between a minimum and living wage ($15,080 to $21,152); and not earning a postsecondary degree and earning the annual equivalent of a living wage or above ($21,153 and above).[e] Outcomes reported below zero on the horizontal axis are considered negative: those not reported as high school graduates,[f] and those who did not earn a postsecondary degree and earned annual wages less than the full-time equivalent of a minimum wage (less than $15,080 per year).

[d] These groups are not included in the body of the report because of the smaller percentages of Hispanic students, IEP, and LEP students who could be located in data through 2016.

[e] Average annual minimum wage calculated assuming a 40-hour week for 52 weeks at the federal minimum wage of $7.25 per hour. Living wage calculated similarly based on $10.17 per hour for a single adult. From Massachusetts Institute of Technology living wage calculator: http://livingwage.mit.edu/states/21/locations.

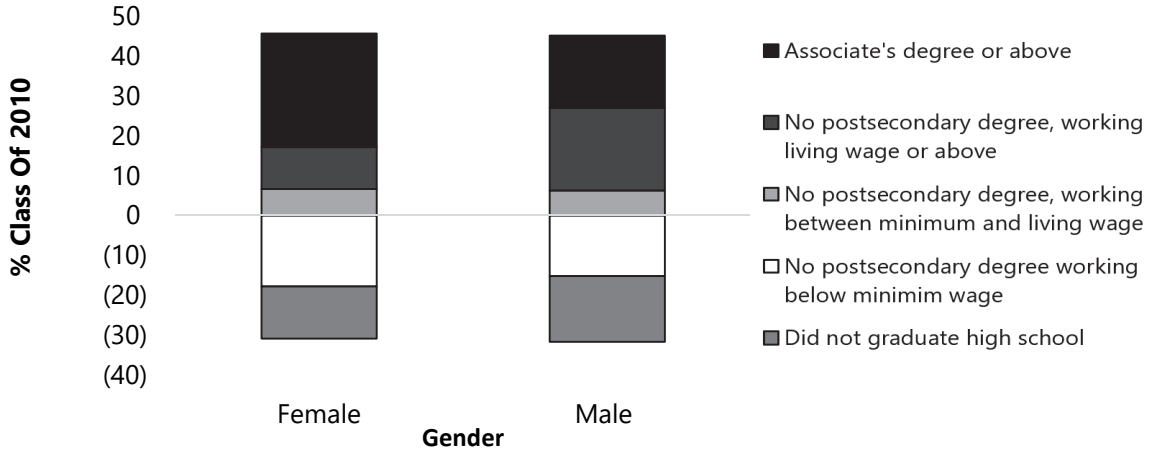
[f] These are assumed to be high school dropouts, though not all were coded specifically as dropouts in student enrollment data.

Female students from the class of 2010 were more likely to earn a postsecondary degree, whereas male students working without a postsecondary degree were more likely to be earning a living wage.

As shown in Figure 1.A, male and female students were about equally likely to have generally positive outcomes, but in different ways. Female students were more likely than male students to have earned a postsecondary degree (29 percent versus 18 percent), whereas the percentage of students working without a postsecondary degree and earning a living wage was higher for male students than for female students (22 percent versus 17 percent). It is possible that males' relatively better chances of earning a living wage without a college degree offer a partial explanation for their lower college graduation rates.

Negative outcomes for males versus females also differed. While male students were more likely than female students not to graduate from high school, they were less likely than female students to be working without a degree for less than a minimum wage.

Figure 1.A
Class Of 2010 General Outcomes By Gender, Through 2016



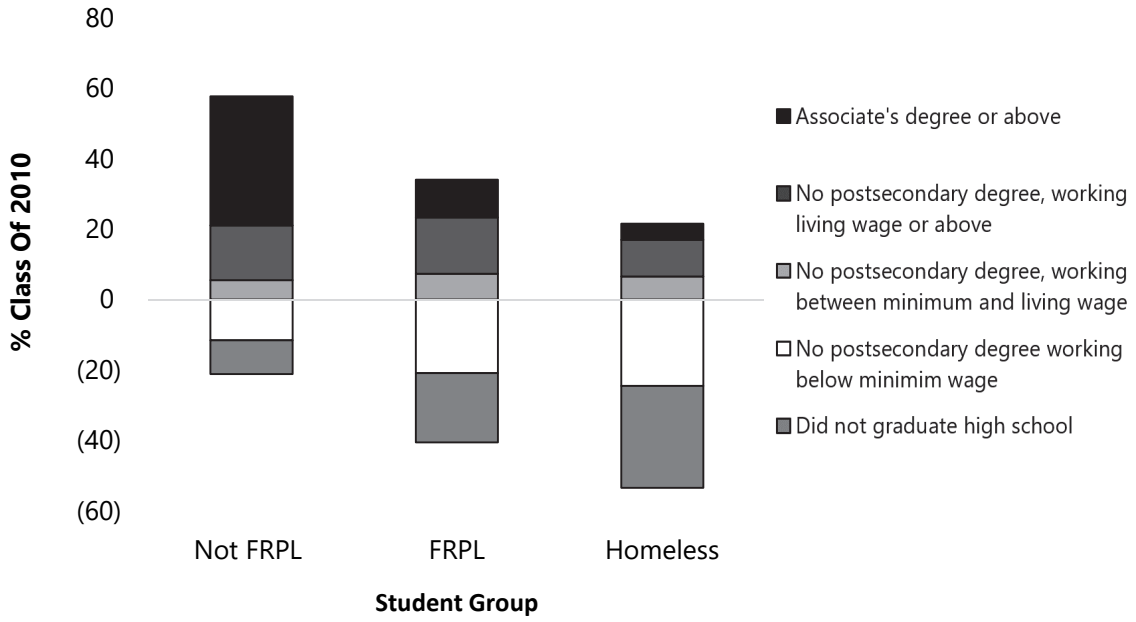
Note: The percentages in this figure are calculated using the total number of students whose outcomes could be identified through 2016 and who were not enrolled in postsecondary education in that year. Elsewhere in this report percentages are calculated using graduates, estimated total cohort numbers, or workers. Outcomes considered to be negative are reported below zero. The absolute value of percentages reported total 100.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Students from higher-income families—those not eligible for the federal free or reduced-priced lunch (FRPL) program—earned postsecondary degrees at about three times the rate of FRPL students and were about half as likely to be working for less than minimum wage.

Figure 1.A shows that, through 2016, class of 2010 students from higher-income (non-FRPL) families had a much higher percentage of positive outcomes than did FRPL students. Non-FRPL students earned a postsecondary degree at more than three times the rate of FRPL student and were approximately half as likely to be working without a degree for less than minimum wage. Students considered to be homeless in high school because they were living with relatives or in temporary or unsafe housing were much more likely

to have negative outcomes; 33 percent were not reported as having graduated from high schools and 39 percent were working without a postsecondary degree for less than minimum wage.

Figure 1.B
Class Of 2010 General Outcomes By FRPL And Homeless Status Through 2016



Note: The percentages in this figure are calculated using the total number of students whose outcomes could be identified through 2016 and who were not enrolled in postsecondary education in that year. Elsewhere in this report percentages are calculated using graduates, estimated total cohort numbers, or workers. Outcomes considered to be negative are reported below zero. The absolute value of percentages reported total 100.
FRPL = free or reduced-price lunch.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Incarceration

Three percent of the class of 2010 had been incarcerated by 2016. Compared to all students, homeless students were three times as likely and highly mobile students were seven times as likely to be incarcerated.

Not reported in Figures 1.A and 1.B are incarceration rates for the class of 2010. Three percent of the class of 2010 had been incarcerated at least once by 2016. Appendix B provides a brief, preliminary analysis of these rates, along with high school indicators associated with incarceration. The appendix shows that homeless students are incarcerated at three times the rate of all students and that students who are highly mobile are incarcerated at more than seven times the rate of all students.[g]

[g] The mobility calculation included enrollment codes for students entering a school from another Kentucky school. It is possible that some of these students are transferring from alternative schools rather than moving school locations.

Wages By Educational Attainment

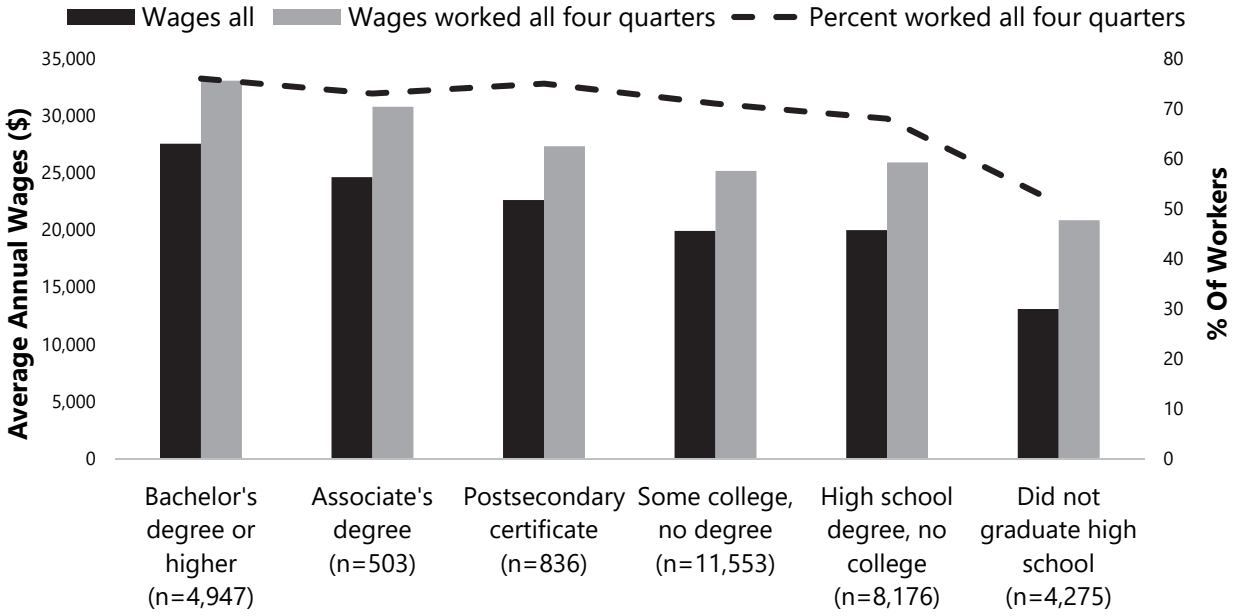
Figure 1.C shows the average FY 2016 wages by educational attainment level for the class of 2010. The table ranges from those who were not reported as having graduated from high school (dropouts or presumed dropouts) to those who earned an associate's or bachelor's degree. It also includes wages for graduates who have earned workforce certificates, which are nondegree credentials granted by postsecondary institutions based on specialized work-related courses. Average wages are shown two ways: for all workers regardless of whether they worked all four quarters in the year, and average wages for those who worked all four quarters.[h] The figure also shows the percentage, for each education attainment level, of workers who worked all four quarters. As education level increases, so does the proportion of workers working all four quarters; approximately half of those who were not reported graduated from high school worked all four quarters, compared to approximately three-quarters of those with a postsecondary degree or certificate.

Average FY 2016 wages for the class of 2010 increased for each level of educational attainment, ranging from $13,000 for those who did not graduate from high school to over $27,000 for those with a bachelor's degree or above.

As the figure shows, average wages increase substantially for each level of educational attainment, ranging from approximately $13,000 for all those who did not graduate from Kentucky public schools to over $27,000 for graduates with a bachelor's degree or above. The figure also shows substantially higher wages at every educational level for those working all four quarters. The wage increase associated with working four quarters is especially evident for those who did not graduate from high school. The average wage of $21,000 for those working all four quarters is roughly $8,000 more than the wage of approximately $13,000 earned by all workers. For this group of workers, working all four quarters represents an increase of 60 percent. However, high school noncompleters are the least likely of all workers to be working all four quarters.

[h] UI wage data do not include hours worked so it is not possible to report what proportion of workers were employed full time, even if they worked four quarters.

Figure 1.C
Class Of 2010 FY 2016 Wages And Percentage Who Worked All Four Quarters By Highest Educational Attainment



Note: Individuals who earned a degree but were not reported as graduates in Kentucky public schools were assumed to have graduated. This figure includes any individual who was ever part of the class of 2010 who was working in 2016 and not enrolled in any Kentucky postsecondary education.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

As shown in Appendix C, wages also vary substantially among workers in each education attainment level. For example, while wages were generally lower for those who were not reported as having graduated from high school, approximately one-fifth of this group was earning a living wage. Conversely, while wages were generally higher for those who earned a bachelor's degree, approximately one-quarter of this group worked for an annual equivalent of less than a minimum wage.

A postsecondary degree is associated with higher wages, regardless of high school ACT score. For workers with a postsecondary degree, wages increase with ACT score.

Figure 1.D shows FY 2016 wages by ACT composite score for 2010 graduates, with and without a postsecondary degree. Data are shown separately for workers who were eligible for FRPL in high school and those who were not. The figure shows that a postsecondary degree is associated with higher wages, regardless of high school ACT score.[i] For workers with a postsecondary

[i]The pattern does not hold for non-FRPL graduates with ACT scores of 14 or less. These graduates earned similar wages, with or without postsecondary degrees.

degree, wages also increase with ACT score.[j] In contrast, wages for workers with no postsecondary degree do not vary substantially by ACT score.

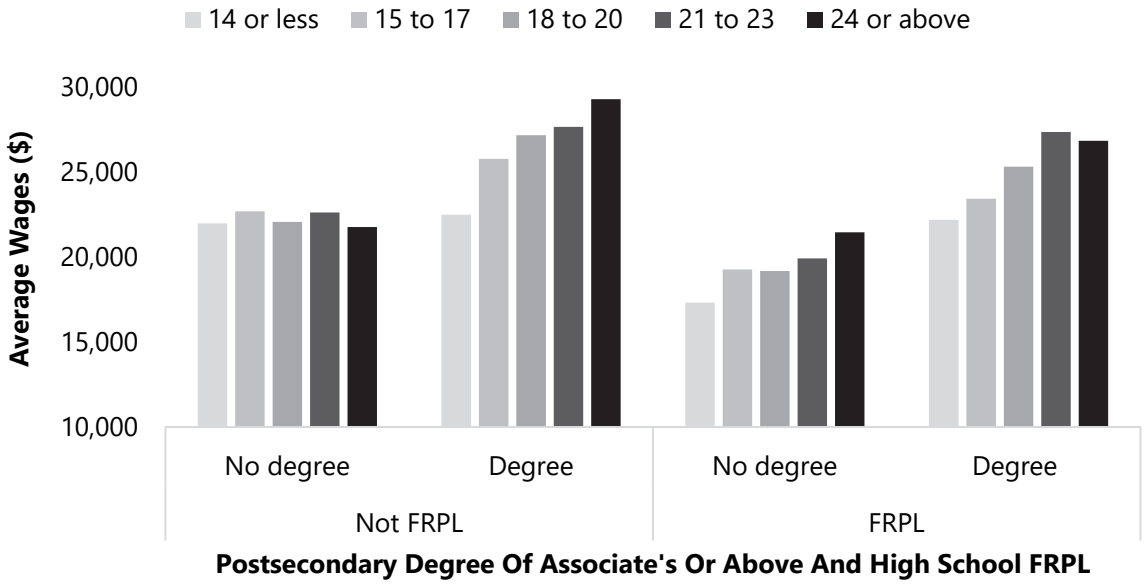
College wage premiums were generally higher for workers who were FRPL as high school students.

Appendix D provides values for the figure and shows the wage premium associated with a postsecondary degree based on high school FRPL eligibility. Although a postsecondary degree was associated with higher wages for almost all graduates, the postsecondary degree premium was generally higher for workers who were eligible for FRPL in high school.

Workers who had been eligible for FRPL in high school earned less than ineligible peers with similar education and ACT scores.

Figure 1.D also shows that, of graduates who entered the workforce without a postsecondary degree, those who had been eligible for FRPL earned less than ineligible peers with similar education and ACT scores. Wage differences associated with FRPL eligibility were especially apparent in the lowest ACT range. FRPL graduates with an ACT composite of 14 or less earned approximately $16,500 whereas similarly scoring non-FRPL graduates earned approximately $21,300.

Figure 1.D
Average FY 2016 Wages Of 2010 Graduates By Postsecondary Degree, ACT, And FRPL



Note: FRPL= free or reduced-price lunch.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

[j] As shown in Chapter 3, ACT is less associated with wages for workers without a postsecondary degree.

High School Indicators Of Success: College Versus Workforce With No Degree

Chapters 2 and 3 show similarities and differences in the relationships between high school indicators and postsecondary success for students seeking a college degree versus those who enter the workforce without a college degree.

In the chapters that follow, relationships between high school indicators and postsecondary outcomes are examined separately as they are associated with earning a postsecondary degree (Chapter 2) and working without earning a degree or credential (Chapter 3). Figures 1.E and 1.F summarize some of the similarities and differences for high school GPA, ACT, and attendance.

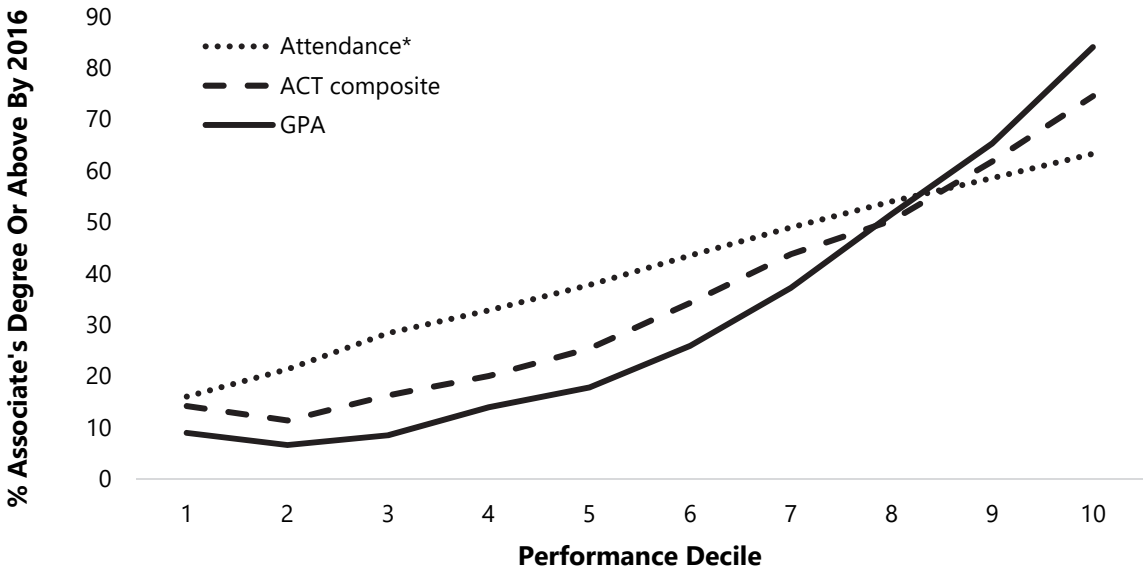
Figures 1.E and 1.F provide an overview of the relationships between attendance, ACT composite scores, and GPAs in each population. Each indicator is divided into deciles based on characteristics of the entire graduating class, and Table 1.2 shows the values corresponding with each decile. Indicators are ranked from worst to best outcomes so that decile 1 represents the worst and decile 10 the best. Overall, the figures show that, whereas outcomes for college-going graduates improve most in the highest deciles of ACT and GPA, outcomes for graduates directly entering the workforce improve most in the lowest deciles for those indicators. Outcomes for both groups improve steadily as attendance increases.

College degree attainment increases as high school attendance, GPA, and ACT increase. The likelihood of earning a degree increases steeply if a student is in the top 30 percent of the class when ranked by GPA or ACT.

Figure 1.E shows the relationship, for those who enrolled in college, between each indicator and the percentage of students who earned an associate's degree or above by 2016.[k] Degree attainment increased steadily with attendance, but the increases associated with ACT and GPA were concentrated in the three highest deciles. Degree attainment based on ACT composite increased by 24 percentage points in the top three deciles, compared to only 2 percentage points in the bottom three deciles. For GPA, degree attainment increased by 33 percentage points in the top three deciles but did not increase at all in the bottom three.

[k] Over 80 percent earned a bachelor's degree.

Figure 1.E
Six-Year Degree Attainment Of College Enrollees By High School Attendance, ACT Composite, And GPA
2010 Graduates



Note: The 1st decile represents the worst high school outcomes and the 10th the best. Decile values are calculated from the entire population of the class of 2010. Average values within those deciles are calculated from only the 19,729 non-college-enrolling 2016 workers included in this figure.
* The lowest attendance decile represents the highest number of absences. Degree attainment is calculated as a percentage of 2010 graduates enrolled in college in the fall of 2010.
Source: Kentucky Center for Education and Workforce Statistics.

Table 1.2
Average Values Corresponding With Performance Decile For ACT Composite, Attendance, And GPA
Class Of 2010

Decile	Number Of Absences	ACT Composite	GPA
1	60	12	1.3
2	32	13	1.8
3	23	14	2.1
4	18	15	2.3
5	14	16	2.6
6	11	17	2.8
7	9	19	3.1
8	7	20	3.3
9	4	23	3.6
10	2	28	3.9

Note: Number of absences is included only for those enrolled for approximately half of a year (89 days). GPAs are taken from the last year available.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

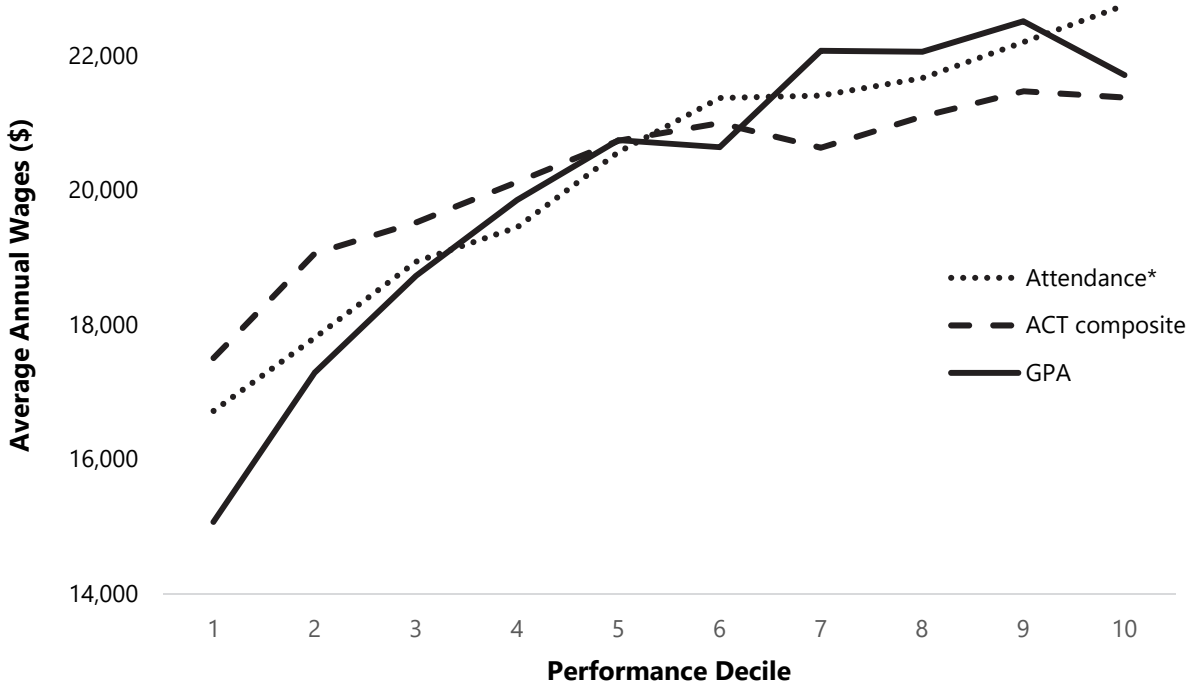
Average annual wages of students who enter the workforce without earning a postsecondary degree increase as high school attendance and GPA increases.

Figure 1.F shows the average annual wages in FY 2016 of graduates who were working without a postsecondary degree or credential. As the figure shows, average annual wages increased steadily from lowest to highest across most deciles of attendance and GPA, but they increased more steeply in the lowest three deciles than in the top three.

Higher ACT scores are not associated with substantially higher wages.

Wages associated with ACT also increased substantially in the lower deciles (over $2,000 from decile 1 to decile 3) but little or none after the fifth decile (ACT composite of 16). Thus, in contrast to the college-going population, ACT scores greater than 16 are not associated with better outcomes for high school graduates working without a postsecondary degree or credential.

Figure 1.F
Average Annual Wages In FY 2016 Of 2010 Graduates Working Without A Postsecondary Degree Or Credential By High School Attendance, ACT Composite, And GPA



Notes: The 1st decile represents the worst high school outcomes and the 10th the best. Decile values are calculated from the entire population of the class of 2010. Average values within those deciles are calculated from only the 19,729 workers with no postsecondary degree.
*The lowest attendance decile represents the highest number of absences.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Chapters 2 and 3 provide additional analysis of the relationships between high school indicators and postsecondary outcomes. Each chapter reports outcomes based on student demographic characteristics and analyzes additional high school indicators. Chapter 2 examines degree attainment for college-going graduates, including attainment based on KDE-approved indicators of college readiness beyond the ACT. Chapter 3 focuses on workforce outcomes for those who do not earn a degree or credential. In addition to the variables reported above, Chapter 3 examines wage premiums associated with CTE education and high school behavior indicators.

Chapter 2

High School Indicators Of College Success

This chapter looks in greater detail at high school predictors of success in postsecondary education, focusing on 6-year degree-earning rates for the class of 2010 and early outcomes for the class of 2015.

By 2016, the class of 2010 had earned college degrees at a rate that is lower than the nation's but consistent with the level required by Kentucky's current workforce demands. College readiness based on the ACT test in 11th grade was a strong predictor of college graduation for this class, as were high school GPAs of 3.5 or above. Preliminary data from the class of 2015 suggest that college readiness based on the Compass and KYOTE college placement tests alone is less likely to predict college success.

Taking ACT scores into account, college degree-earning rates were similar for 2010 graduates of different races but were substantially lower for FRPL students. The chapter shows that qualified FRPL students represent an immediately available pool of additional college graduates. Had FRPL students from the class of 2010 earned a college degree at the same rate as their non-FRPL peers, the degree-earning rate for the class would have been 20 percent higher.

The chapter concludes with a discussion of two steps that policy makers can to increase college attainment rates:

- Focus efforts to identify and support students not on track for college readiness early in high school rather than during their senior year.
- Consider additional policies aimed at supporting qualified FRPL students to enroll, persist, and graduate from college.

Degree Attainment, Class Of 2010

By 2016 just over one-quarter of the class of 2010 had earned an associate's degree or above.

Table 2.1 reports numbers and percentages of students earning an associate's or bachelor's degree by 2016. The table shows the level of students earning a degree as an approximate percentage of the total class and as a percentage of those graduates who enrolled directly in college in the fall of 2010. Just under half (48.5 percent) of fall 2010 enrollees earned a degree within 6 years, whereas just over one-quarter (25.8 percent) of the estimated entire class did so.

Table 2.1
Postsecondary Degrees Earned By Class Of 2010
Through 2016

Population	Total	Associate's Only		Bachelor's Or Above*		Percent Associate's Or Above
		Number	Percent	Number	Percent	
Total enrolled fall 2010 in 2- or 4-year institution	24,771	1,920	7.8%	10,096	40.8%	48.5%
Estimated class of 2010**	47,893	2,012	4.2	10,352	21.6	25.8

Note: Some numbers do not sum due to rounding. Calculations are based on Kentucky Council On Postsecondary Education data as well as National Student Clearinghouse data, thus capturing class of 2010 students earning a degree in Kentucky or other states.
*Included in this group are students who earned both an associate's and a bachelor's degree.
**Percentages for estimated class are derived by dividing the total number of individuals from the class with a degree by the estimated number of students in the class as determined by the total number (47,893) enrolled in the 11th grade.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Approximately 3.5 percent of the class of 2010 had earned a postsecondary certificate but no degree.

Table 2.2 shows the number of individuals earning certificates and the number of individuals earning only certificates as a percentage of the estimated class of 2010. Approximately 3.5 percent of the class earned at least one certificate but no other degree, whereas 6.3 percent of the class earned a certificate in addition to an associate's or bachelor's degree.

Table 2.2
Postsecondary Certificates Earned By Class Of 2010
Through 2016

Total Estimated Class	Certificate Only		Certificate Total	
	Number	Percent	Number	Percent
47,893	1,706	3.5%	2,996	6.3%

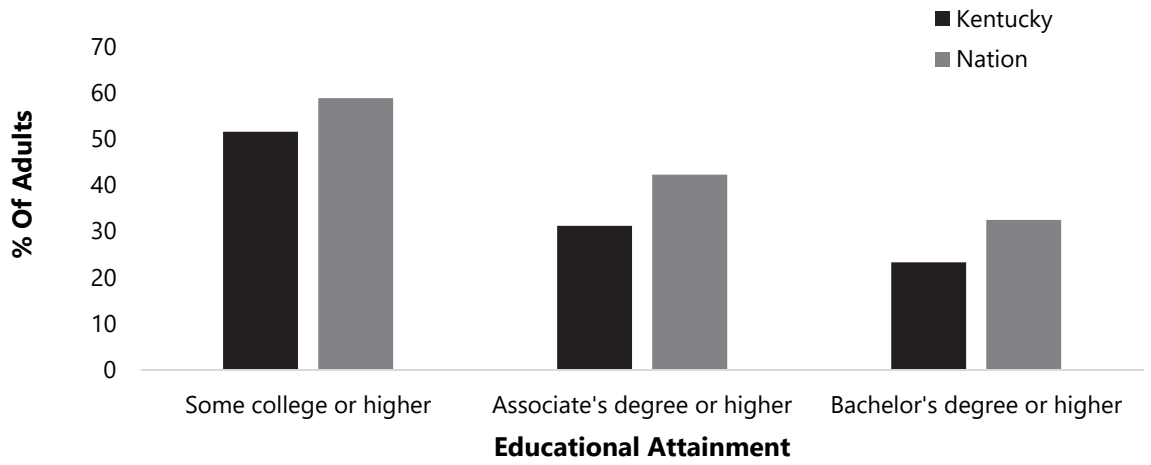
Source: Kentucky Center for Education and Workforce Statistics.

As reported by the US census, Kentucky lags the nation substantially in the percentage of adults with a college degree.

Figure 2.A compares US census estimates of degree attainment for Kentucky and the nation for individuals 25 years or older. At 42.3 percent, the percentage of US adults with associate's degree or higher is 1.36 times Kentucky's rate (31.1 percent); the percentage of US adults with a bachelor's degree or higher (32.5 percent) is 1.39 times Kentucky's rate (23.3 percent). However, at 58.9 percent, the percentage of US adults with some college or more is only 1.14 times Kentucky's rate (51.6 percent).[a]

[a] Subtracting the percentage of adults with an associate's degree or more from the percentage of adults with some college or more, it can be inferred that 16.6 percent of US adults enrolled at some point in postsecondary education but failed to earn a degree whereas 20.4 percent of Kentucky adults did so.

Figure 2.A
US Census Estimates Of Educational Attainment
Adults 25 And Older In Kentucky And The Nation
2015



Source: United States. Census Bureau.

In terms of the percentage of people with a college degree, the rate for the class of 2010 is approaching the rate for Kentucky adults but substantially below the rate for US adults.

Comparing the percentage of the class of 2010 with a degree of associate's or above as reported in Table 2.1 with the percentage of adults with a degree as reported in Figure 2.A shows that the percentage of the class of 2010 with an associate's degree or above (25.8 percent) is approaching that of Kentucky adults (31.2 percent) but is still substantially behind adults nationally (42.3 percent).

Many graduates from the class of 2010 have enrolled in college but have not yet earned a degree.

The extent to which the degree attainment of the class of 2010 approaches national rates will depend on how many of those in the class who have not yet earned a degree ultimately do so. By 2016, over 33,000 students or about 70 percent of the entire class had enrolled in some form of postsecondary education and almost 26 percent of the class had earned an associate's degree or above. About 21,000 or 45 percent of the class had enrolled in some form but not yet earned a degree. OEA's calculations indicate that over half of those who had enrolled but not yet earned a degree had enrolled in some capacity in at least 3 school years.

The college graduation rate for the class of 2010 is unlikely to reach the national rate.

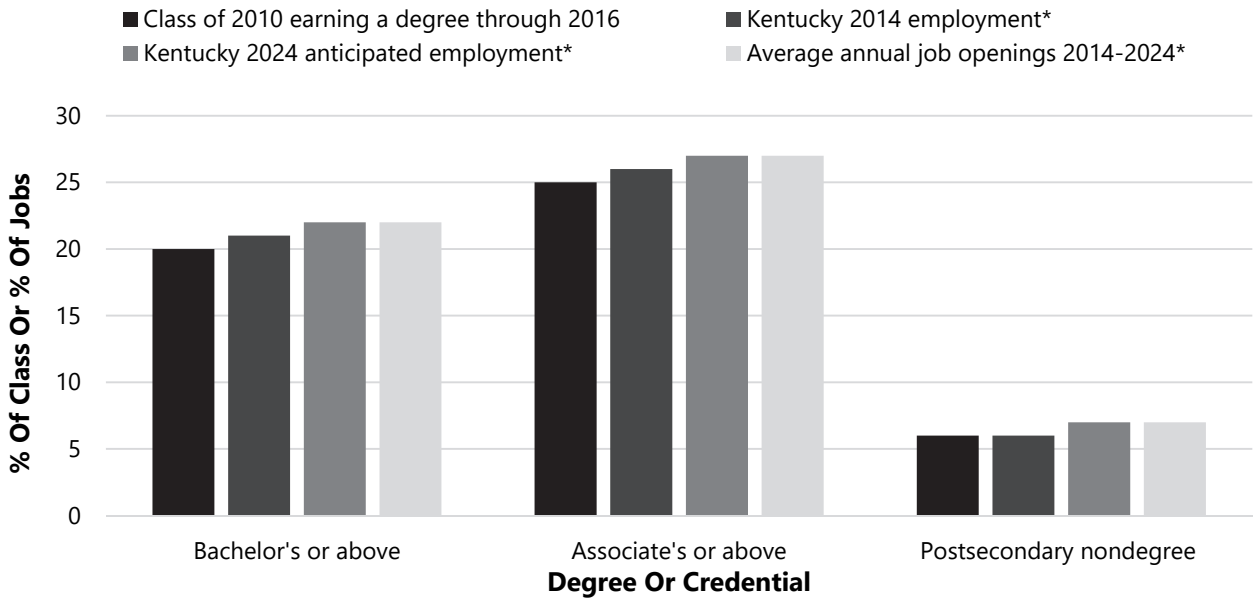
Even if many of those who have not yet done so earn a degree, members of the class of 2010 are unlikely to graduate from college at a rate that substantially closes the gap between Kentucky and the nation in the percentage of the adult population with degrees. Through 2016, the class of 2010 was graduating at a lower rate than national first-time college enrollees. Of Kentucky students who enrolled in the fall of 2010, 48.5 percent had earned a degree

by 2016.[b] According to the National Student Clearinghouse, 54.8 percent of all first-time students had earned a degree by 2016.[c]

Degree attainment of the class of 2010 is close to the level required by current workforce demand as reported by the Kentucky Education and Workforce Development Cabinet.

Although the class of 2010 lags the nation in degree attainment, it has produced college graduates at a rate that approaches the level required by current Kentucky workforce demand. Figure 2.B compares postsecondary educational attainment of the class of 2010 with Kentucky workforce demand as reported by the Kentucky Education and Workforce Development Cabinet. Twenty-six percent of the class of 2010 has earned an associate's degree or above, whereas 27 percent of job openings in the next 10 years are anticipated to require those degrees. Six percent of the class have earned certificates, whereas 7 percent of job openings are anticipated to require certificates.

Figure 2.B
Class Of 2010 Degree-Earning Rates Through 2016
Compared To Kentucky Workforce Demand



*Some economists believe that the method used to calculate these percentages underestimates the true workforce demand because the method reports the minimum education required for particular jobs rather than the educational level of workers actually holding those jobs.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

[b] As calculated by OEA using KCEWS data and shown in Table 2.1.
[c] National Student Clearinghouse Research Center. "Completing College: A National View of Student Attainment Rates—Fall 2010 Cohort." P. 5. Web. Accessed Sept 9, 2017. Note: The calculation includes any student who enrolled in fall 2010, regardless of institutional sector or intensity. The NSC data compares all first-time enrollees, not only the recent graduates included in OEA's calculations for the class of 2010.

Some economists believe that the true demand for degreed workers is higher than what has been reported.

Some economists believe that the methods used to calculate workforce demand as reported in Figure 2.B underestimate the true demand for degreed graduates because the methods are based on data that report the minimum requirements for a job as determined by the Bureau of Labor Statistics rather than the actual degrees held by workers employed in the jobs. According to the American Community Survey of 2010, almost two-thirds of jobs were held by workers with some postsecondary education. Although some jobs, such as retail managers, might not require postsecondary education, many of the workers holding those jobs do have education beyond high school and may have a competitive advantage in their jobs.[3] In addition, to the extent that policy makers hope to attract higher-paying industries to the state, the percentage of jobs that currently require a postsecondary degree does not necessarily match the percentage necessary to attract new industries.

National research has shown that college graduation rates are affected by the characteristics of enrolled students, including their academic preparation; by practices in postsecondary institutions; and by social and economic factors affecting students, including the need to earn income while in school.[4] In the section that follows, the report focuses on the high school indicators associated with graduation by 2016 for the class of 2010.

College-Readiness Measures

Kentucky high school graduates have been considered college ready based on benchmarks set by the Kentucky Council on Postsecondary Education in English, mathematics, and reading. Graduates can demonstrate readiness on the ACT test and two college placement tests.

In accordance with 703 KAR 5:200, which went into effect in 2012, a student was counted as college ready in the state's accountability system if the student met benchmarks in English, mathematics, and reading on any of the college-readiness or placement tests accepted by CPE for admission or course placement in Kentucky's public postsecondary institutions. These included the ACT college-readiness test, the Kentucky Online Testing (KYOTE) placement test, and ACT Compass placement tests.[d] Since 2008, statute has required the ACT for all Kentucky public school students in the 11th grade. Beginning in 2018, it will no longer be required.

[d] As of 2016, CPE college-readiness indicators included, in addition to the ACT, the SAT college-readiness test, the KYOTE, and portions of the high school GED test. For a full description of CPE college-readiness indicators as of 2016, see cpe.ky.gov/policies/academicaffairs/collegereadinessindicators2016.pdf. The Compass test has been discontinued, but KDE's proposed accountability system will continue to count as college ready any student who meets college admissions test benchmarks established by CPE that allow students to take credit-bearing classes.

ACT College-Readiness Test

This study focuses on ACT scores as an indicator of readiness because these are the only standardized and comparable data available for the entire class. The study uses the ACT composite score, which is an average of each student's score on the English, math, reading, and science sections of the ACT. CPE has set college-readiness benchmarks of 18 for English, 20 for reading, and 19 for mathematics. There is no CPE college-readiness benchmark for science.

Twenty-two percent of the class of 2010 were college ready on ACT tests in the 11th grade.

As shown in Table 2.3, the average ACT composite score for the class of 2010 was 18.1. Of the 46,700 students who took the ACT, 10,333 or 22 percent met all three college-readiness benchmarks on the ACT. The average ACT composite score of college-ready students who met all three benchmarks on the ACT was 24.9. Sixty percent of the college-ready graduates who met all three benchmarks on the ACT had earned a degree by 2016.

Table 2.3
Class Of 2010 Meeting CPE College-Readiness Benchmarks On ACT And Earning A Degree By 2016

Total Number	Average Composite Score	Met Benchmarks On ACT English, Reading, And Math		Met Benchmarks And Earned Associate's Degree Or Above By 2016	
		Number	Percent	Number	Percent
46,700	18.1	10,333	22%	6,179	60%

Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

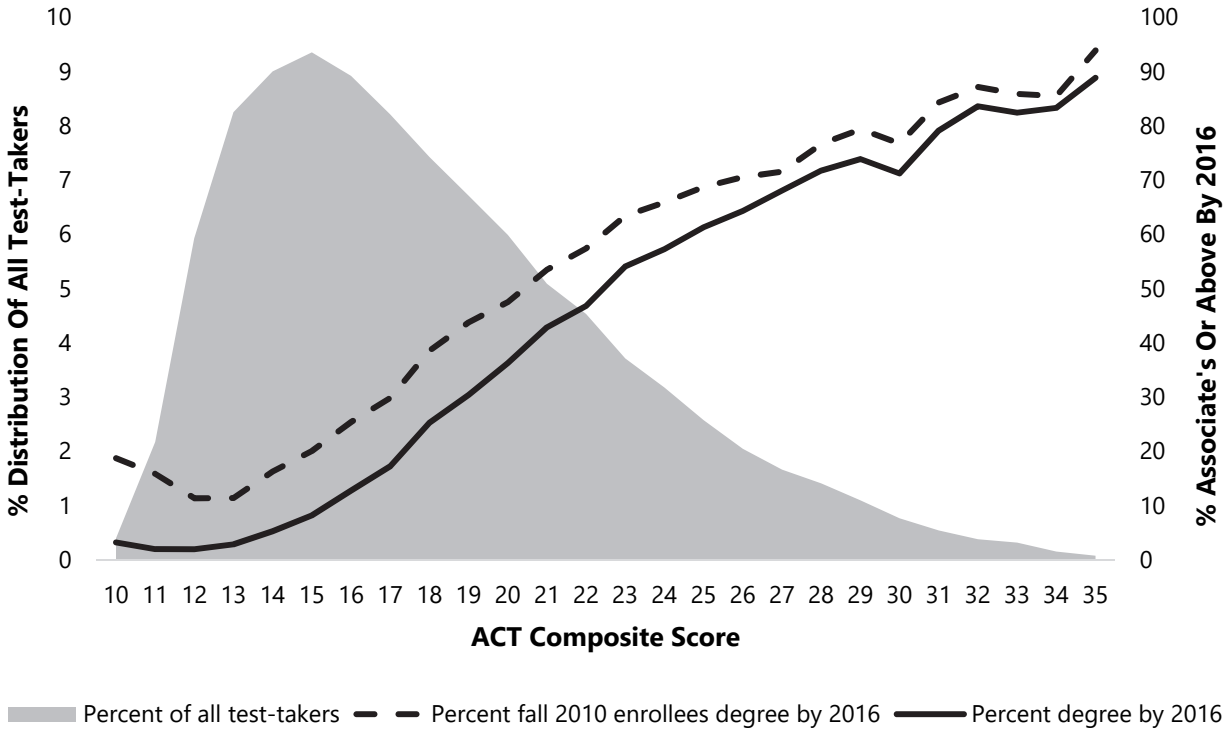
Figure 2.C shows the percentage of students in the class of 2010 who earned an associate's or bachelor's degree by 2016, by ACT composite score. The solid line represents the degree completion rates for all students who took the ACT, and the dotted line represents the degree completion rates for students who enrolled immediately in college (fall 2010). The shaded region shows the distribution of ACT composite scores in the entire tested population.

Class of 2010 students who had an ACT composite score of 23 had at least a 50 percent likelihood of earning an associate's degree or above by 2016.

As Figure 2.C shows, the likelihood of earning a degree increases sharply with ACT score. For example, 8 percent of students with an ACT composite of 15 earned a degree versus 71 percent of students with a composite of 30. It is only at an ACT composite of 23 or higher that the population of tested students were likely (had a 50 percent chance or greater) to earn a degree within 6 years. The college graduation rate was similar, but slightly higher, for students who enrolled in college immediately after graduation (fall 2010), compared to the college graduation rate for all students in

the class of 2010. The ACT composite score at which students who immediately enrolled in college became likely to graduate was 21.

Figure 2.C
Distribution Of ACT 11th-Grade Test-Takers And Percentage Of Class Of 2010 And Fall 2010 Enrollees Earning A College Degree, By Composite Score



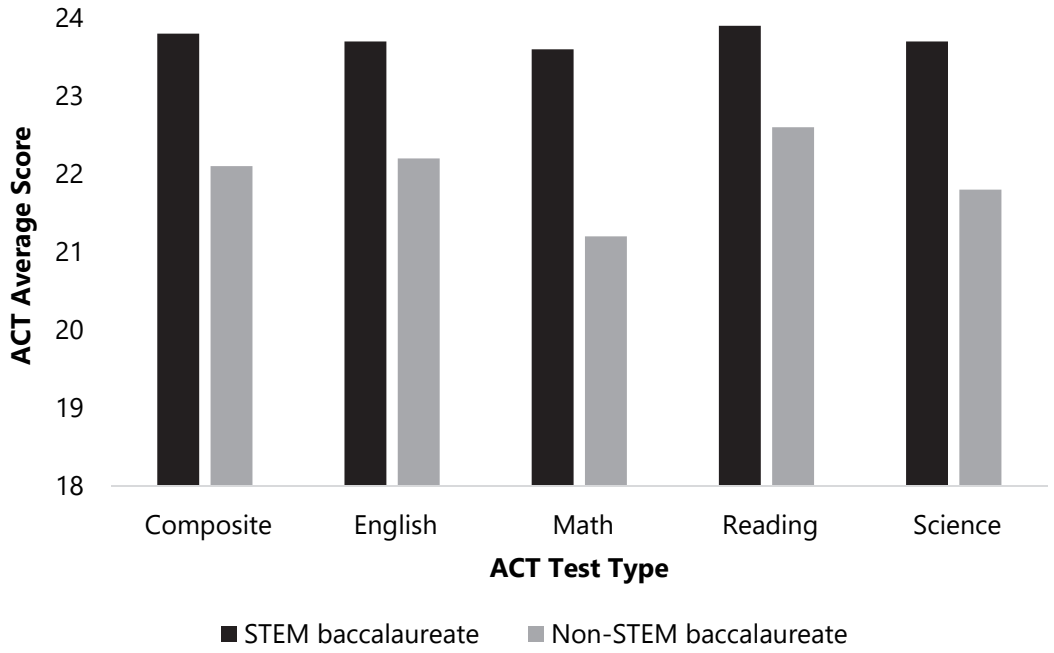
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Figures 2.D and 2.E show that ACT scores associated with degree attainment vary depending on degree major and type. These figures report average ACT composite and subject scores for those who graduated with majors in science, technology, engineering and math (STEM) and non-STEM fields.

Average ACT scores are higher for college graduates earning degrees in science, technology, engineering, and math (STEM) fields than for those earning degrees in non-STEM fields.

As shown in Figure 2.D, the average ACT composite score is almost 2 points higher for those who graduate with a baccalaureate degree in STEM fields than for those with a baccalaureate degree in a non-STEM field. Differences in ACT subject scores are greatest in math (2.4 points).

Figure 2.D
11th-Grade ACT Composite And Subject Scores By STEM And Non-STEM Majors For 2010 High School Graduates With Baccalaureate Degree By 2016

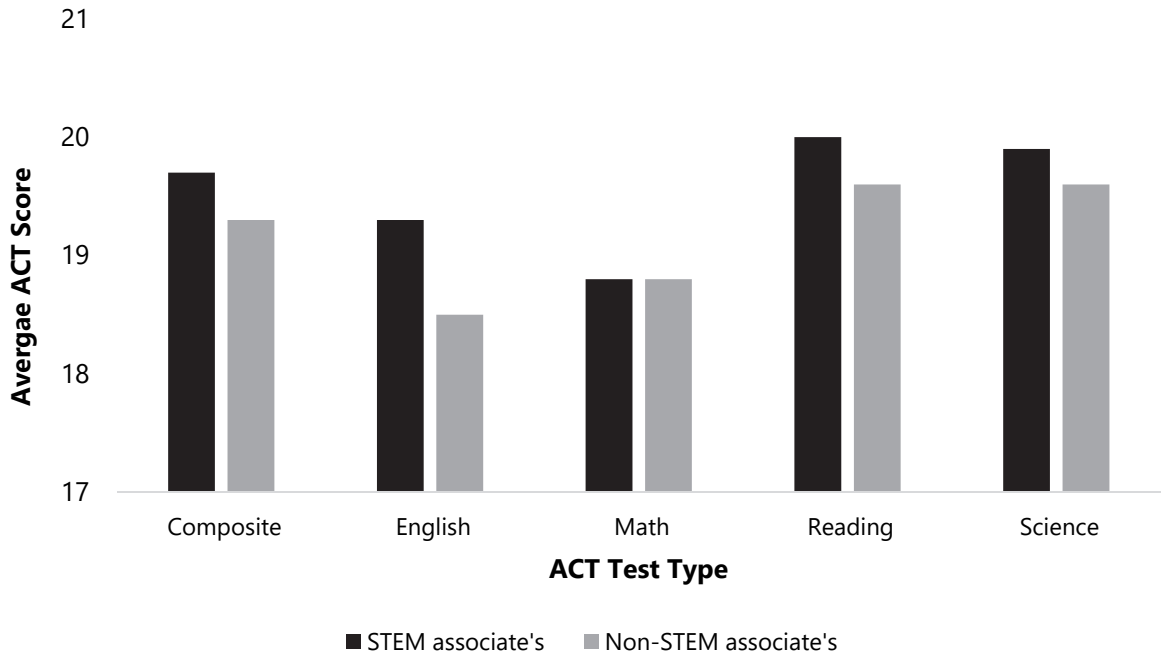


Note: Data include only those who earned a degree from a Kentucky public postsecondary institution.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

On average, students who earned bachelor's degrees had higher ACT scores than those who earned associate's degrees.

Figure 2.E shows that, overall, average ACT composite scores are lower for those who graduate with an associate's degree than for those who graduate with a baccalaureate degree in both STEM (19.7 for associate's versus 23.8 for baccalaureate) and non-STEM majors (19.3 for associate's versus 22.1 for baccalaureate). In addition, the differences in ACT composite and subject scores between STEM and non-STEM majors are smaller for those who earn associate's degrees. For these graduates, average reading and English scores are higher than math scores, and there is no difference between STEM and non-STEM majors in ACT math scores.

Figure 2.E
11th-Grade ACT Composite And Subject Scores By STEM And Non-STEM Majors For 2010 High School Graduates With Associate's Degree By 2016



Note: Data include only those who earned a degree from a Kentucky public postsecondary institution.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

College Readiness For Students Not Meeting ACT Benchmarks In 11th Grade

Accelerated Learning And Intervention In 12th Grade. KRS 158.6459 requires that a high school student whose highest score on the 11th-grade administration of the ACT does not meet college-readiness benchmarks be provided the opportunity to participate in accelerated learning prior to graduation.
704 KAR 3:305, sec. 2 requires that students not meeting CPE benchmarks in English or mathematics take a transitional course or intervention prior to graduation from high school. Students who do this and subsequently meet benchmarks by retaking the ACT or by taking the Compass or KYOTE tests prior to graduation are considered college ready.

Compass and KYOTE tests have been free to students and can be administered throughout the year in any school. The ACT can be taken only on specified dates and at specified locations, and it must be paid for, either by individual students or, for FRPL students,

with waivers available from ACT. ACT Inc. provides schools with waivers for up to two retakes for FRPL students.[e] [5]

The percentage of high school graduates deemed college ready in Kentucky increased from 32 percent to 55 percent between 2011 and 2014. This steep increase was explained primarily by students demonstrating college readiness on college placement tests rather than on the ACT.

College Readiness By College Placement Tests. As OEA reported in its 2014 study on college and career readiness, the percentage of high school graduates deemed college ready in Kentucky increased from 32 percent to 55 percent between 2011 and 2014.[6] This steep increase was explained primarily by the number of students demonstrating readiness on college placement tests versus on the ACT. The 2014 report acknowledged positive results for students no longer required to take remedial courses when they enrolled in college, but also raised concerns, based on initial results from the class of 2012, that students meeting benchmarks primarily or exclusively on Compass and KYOTE tests were not necessarily prepared for college work.[f] Data presented in the section that follows support those concerns.

In 2015, 55 percent of the 26,325 college-ready graduates had demonstrated college readiness by meeting all three required benchmarks on the ACT in the 11th-grade statewide administration. The remaining 45 percent demonstrated college readiness prior to graduation either by retaking the ACT or by taking the KYOTE or Compass tests. Of the college-ready students, 3,385 or 13 percent had not demonstrated college readiness on the English, math, or reading segments of the ACT on the 11th-grade administration.[g]

Although 69 percent of students meeting all three ACT benchmarks in the 11th grade are likely to graduate within 6 years, only 25 percent of those deemed college ready but not meeting any benchmarks on the ACT are likely to earn a degree.

Concerns About Validity Of College-Readiness Measure. Table 2.4 shows the average ACT composite score for all 2015 college-ready students, those who met all three ACT benchmarks in the 11th grade, and those who did not meet any ACT benchmarks in the 11th grade. The table also shows the likelihood of earning a college degree within 6 years, based on class of 2010 ACT data and degree-earning rates. Although 69 percent of students meeting all three ACT benchmarks in the 11th grade are likely to graduate within 6 years, only 25 percent of those deemed college ready but not meeting any benchmarks are likely to earn a degree.

[e] The number of waivers issued to schools is based on the number of fee waivers used the prior year. In 2016, 13,171 were issued in Kentucky and 9,371 were used. In 2017 15,840 were issued and 11,171 were used.
[f] P. 59 of the report showed that students deemed college ready on Compass and KYOTE tests only had lower first-year cumulative GPAs than students who were not college ready at all.
[g] It is possible that some of these students subsequently demonstrated readiness by paying to retake the ACT. ACT scores other than those from the 11th-grade administration were not included in this report.

Table 2.4
Average ACT Composite Score Of 2015 Graduates By College-Readiness Measure And Likelihood Of Earning An Associate's Degree Or Higher Within 6 Years

College-Readiness Measure	Average ACT Composite Score	Probability Of Earning College Degree Within 6 Years*
Met all 11th-grade benchmarks	24.9	69%
All college-ready students	22.3	57
College-ready students not meeting any 11th-grade ACT benchmarks	15.9	25

*Based on percentage of class of 2010 who enrolled in fall of 2010 and earned an associate's degree or above by 2016.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

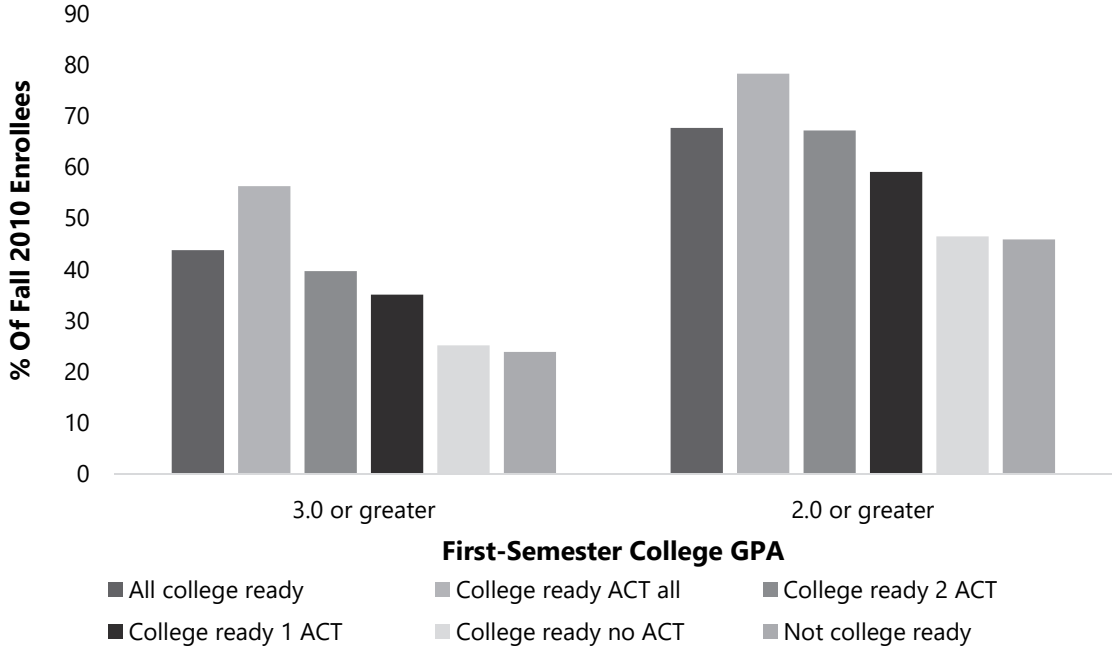
Figure 2.F reinforces concerns raised above about the validity of the college-readiness designation for graduates who do not meet ACT benchmarks. The figure shows first-semester college grades of 2015 graduates based on their college-readiness designations: those who met ACT college-readiness benchmarks in the 11th-grade administration, those who were deemed college ready but did not meet any ACT benchmarks in the 11th-grade administration, and students who were not college ready at all.

2015 graduates who were deemed college ready exclusively on college placements tests earned first-semester college GPAs similar to those of graduates who were not deemed college ready.

Students who were college ready on ACT benchmarks in the 11th grade were much more likely than every other group to earn a GPA of 2.0 or above. Students who were deemed college ready but had not met any ACT benchmarks in the 11th grade were no more likely to earn a GPA of 2.0 and above than students who were not deemed college ready. For example, 78 percent of students who met all three ACT benchmarks earned a GPA of 2.0 or above compared to 45.9 percent of students deemed college ready without meeting any ACT benchmarks and 46.5 percent of students who were not deemed college ready at all.[h]

[h] Although the college-ready group that did not meet ACT benchmarks performed similarly to the not-college-ready students in their first semester, it is possible that the college-ready group will earn degrees at higher rates than the not-college-ready group. National literature has shown that students taking remedial classes are less likely to graduate than students who begin immediately taking credit-bearing classes; students deemed college ready by any measure are not required to take remedial classes. Nevertheless, data reported in Figure 2.F raise concerns that current policy interventions required for high school students may not be sufficient to prepare some students for success in college.

Figure 2.F
First-Semester College Grades Of 2015 High School Graduates
By College-Readiness Measures



Note: Includes only 2015 high school graduates enrolled in a Kentucky public postsecondary institution in fall 2015. "ACT all" = met all ACT college-readiness benchmarks; "2 ACT" = met two ACT college-readiness benchmarks; "1 ACT" = met one ACT college-readiness benchmark; "no ACT" = did not meet any ACT college-readiness benchmarks.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

College readiness based on placement tests alone may not be valid as a predictor of college success.

In its revised accountability system to be implemented in the 2018 school year, KDE has proposed continued use of CPE-approved college placement tests, in addition to the ACT, as college-readiness measures. The validity of these college-readiness measures as predictors of college performance may vary. It is important for policy makers, as well as the public, to understand the differences among college-readiness measures in predicting outcomes in postsecondary education.

Recommendation 2.1

Recommendation 2.1

In its reporting of college-readiness measures on state, district, and school report cards, the Kentucky Department of Education should indicate the number and percentage of students who are considered college ready because they met benchmarks in each of the required subject areas of reading, English, and math on the ACT; those who are college ready on a combination of ACT tests and placement tests approved by

the Council on Postsecondary Education (CPE); and those who are college ready on CPE-approved placement tests alone.

Graduation rates should be reported separately for different college-readiness indicators.

CPE currently reports graduation rates and college-preparedness rates for all of Kentucky's 2- and 4-year institutions. For policy makers to be able to continue to assess the outcomes associated with the state's college-readiness measures, it would be useful to have statewide college-readiness rates disaggregated by particular college-readiness indicators that are being used by Kentucky public schools. In order to continue to evaluate the validity of each measure, it will be important to know the graduation rates of students who enter college ready by these particular indicators. These measures are available to CPE through the data provided by KDE to KCEWS.

Recommendation 2.2

Recommendation 2.2

The Kentucky Department of Education should provide to the Kentucky Center for Education and Workforce Statistics data that indicate whether students were considered college ready because they met benchmarks in each of the required subject areas of reading, English, and math on the ACT; met benchmarks on a combination of ACT tests and placement tests approved by the Council on Postsecondary Education (CPE); or met benchmarks on CPE-approved placement tests alone.

High School GPA And ACT

ACT scores are much more predictive of college graduation when they are combined with student GPAs.

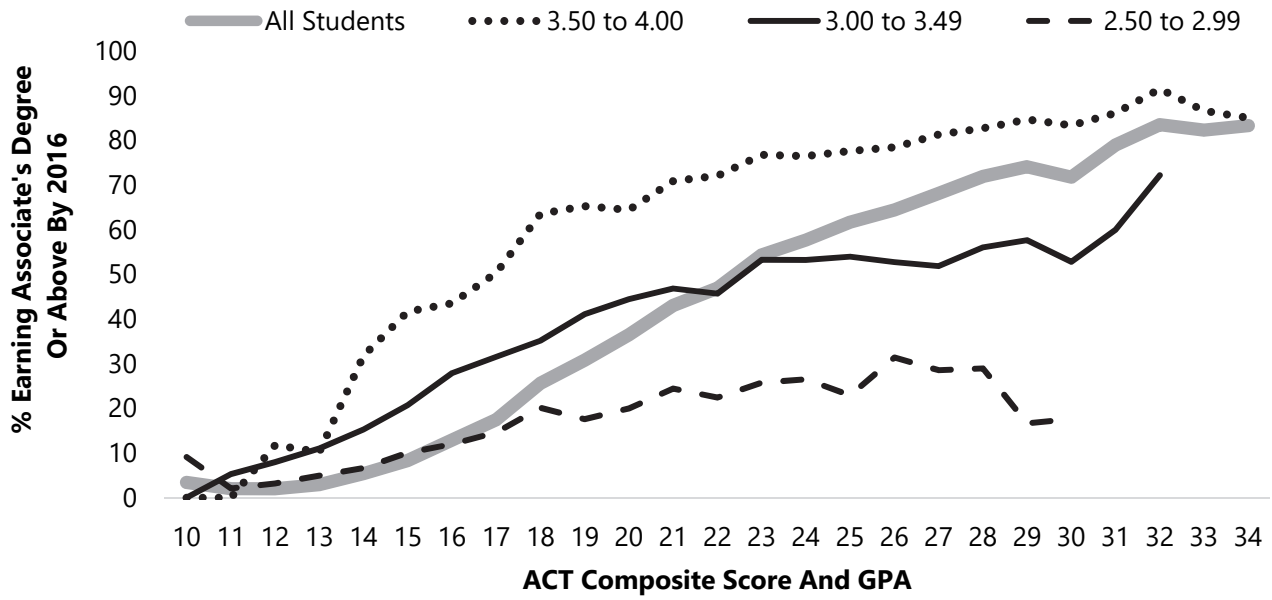
As has been shown in national literature, ACT scores are much more predictive of college graduation when they are combined with student GPAs and, for students who enroll in college, high school GPAs are generally more predictive of college grades than are ACT scores. Data shown in the section that follows illustrate the strong association between high school GPA and college graduation in the class of 2010. In particular, the data show that very high GPAs are more predictive of degree attainment than are very high ACT scores and, regardless of ACT scores, students with low high school GPAs are unlikely to earn a degree.

Class of 2010 graduates with GPAs of 3.5 were much more likely (up to five times as likely) to earn a college degree than graduates with the same ACT score but a GPA of 2.5 to 2.99.

Figure 2.G shows the percentage of students who earned a degree by 2016 by ACT composite and 12th-grade GPA. Students who earn a high school GPA of 3.5 or above are much more likely to earn a postsecondary degree than students with lower GPAs. While the entire population of test-takers becomes likely to graduate at an ACT composite of 23, students with a high school GPA of 3.5 or

above become likely to graduate at an ACT composite of 17. In contrast, students with a high school GPA of less than 3.0 are, on average, not likely to graduate, until they attain an ACT score of 30 or above. Students who earned a composite score of 30 on the ACT and had a high school GPA of 3.5 or above were 5 times as likely to earn a degree as students with the same ACT score and a high school GPA of 2.5 to 2.99 (85 percent versus 17 percent).

Figure 2.G
Percentage Of 2010 High School Graduates Earning An Associate's Degree Or Above By ACT Composite Score And 12th-Grade GPA



Note: For students who did not attend 12th grade in Kentucky public schools, 11th-grade GPA is used.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

ACT scores and GPAs are associated with degree attainment. Most 2010 graduates who earned an associate's degree or above had a high school GPA of 3.5 or above; over one-third had an ACT score of 24 or above.

Overall, both ACT composite and GPAs are strongly associated with degree attainment. As shown in Appendix E, over 50 percent of the 2010 graduates who earned an associate's degree or above had GPAs of 3.5 or above in high school and over one-third had an ACT composite score of 24 or above.

Career And Technical Education

Beginning in 2012, high school graduates were considered career ready if they completed career and technical education (CTE) coursework and passed career skills and career-readiness academic tests.

Beginning in 2012, KDE introduced a career-readiness measure into the state's accountability system. High school students meeting career-readiness criteria are given the same value in the accountability system as those meeting the college-readiness

criteria described earlier in this chapter. To be considered career ready, students must meet each of the following criteria:

- Complete a sequence of two aligned preparatory CTE courses in a specific career cluster that lead to postsecondary education or industry certification or license, and enroll in a third.
- Demonstrate work-related skills by earning an industry certificate or passing a Kentucky Occupational Skills Standards Assessment (KOSSA) test.
- Demonstrate career-ready academic skills by passing the Armed Services Vocational Aptitude Battery or WorkKeys test.

The career-readiness measure reflects the general movement in CTE away from lower-level vocational education and job training in favor of sequenced, academically rigorous programs that build career-specific skills while also preparing students to be successful in postsecondary education.[7]

Black and Hispanic graduates from the class of 2010 were less likely than white graduates to complete CTE. FRPL students were only slightly more likely than non-FRPL students to do so.

In the past, some have raised concerns that disproportionate numbers of poor and minority students are directed into CTE programs and away from academic tracks that would prepare them for college.[i] Table 2.5 suggests that this is not the case in the commonwealth. Black and Hispanic graduates from the class of 2010 were less likely than white graduates to complete CTE preparatory coursework, and FRPL students were only slightly more likely than non-FRPL students to do so (32 percent versus 30 percent, respectively). Overall, students who completed CTE preparatory sequences were slightly less likely than those who did not complete CTE to earn a college degree within 6 years (23 percent versus 28 percent). However, black and FRPL students who completed CTE were equally likely to earn a degree as their peers who did not complete CTE.

[i] See for example, the discussion in Stefanie DeLuca, Stephen Plank, and Angela Estacion, *Does Career And Technical Education Affect College Enrollment?* National Research Center For Career And Technical Education, 2006, P. 2.

Table 2.5
Percentage Of 2010 Graduates Completing CTE Preparatory Sequence
By Student Group And Percentage Earning A College Degree By 2016

Group	Total Number In Group	Percent Of Graduates Completing CTE Preparatory Sequence	Percent Earning Associate's Degree Or Above By 2016	
			Completed CTE	Did Not Complete CTE
All	45,493	31%	23%	28%
Female	22,390	29	28	34
Male	23,056	32	19	23
Black	5,084	18	16	15
Hispanic	987	21	19	21
White	37,929	33	24	30
IEP	2,958	33	4	5
Homeless	1,794	20	8	6
FRPL	22,421	32	13	13
Not FRPL	23,072	30	34	43

Note: CTE = career and technical education; IEP = individualized education program; FRPL = free and reduced-price lunch.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

2010 graduates with lower ACT scores who completed CTE coursework were equally likely as their similarly achieving peers to earn a college degree, but students with higher ACT scores who completed CTE coursework were slightly less likely to earn a college degree.

Table 2.6 shows that students in the lower ACT composite ranges who completed CTE sequences were equally likely as their similarly achieving peers to earn a college degree. Higher-achieving students, however, were slightly more likely to earn a degree if they did not complete CTE training. It is unclear why CTE training decreases the likelihood that higher-achieving students earn a degree. It is possible that workforce opportunities afforded by CTE training reduce or delay students' desire to pursue postsecondary education.

Table 2.6
Percentage Of 2010 Graduates Completing CTE Preparatory Sequence
By ACT Composite And Percentage Earning A College Degree

ACT Composite Score	Number		Percent Earning Associate's Degree Or Above By 2016	
	Completed CTE Sequence	Did Not Complete CTE Sequence	Completed CTE Sequence	Did Not Complete CTE Sequence
14 or less	3,428	6,602	4%	4%
15 to 17	4,127	7,100	14	14
18 to 20	3,004	5,910	30	32
21 to 23	1,684	4,337	47	49
24 or above	1,241	5,276	64	68
No ACT	474	2,310	5	4
Total/average	13,958	31,535	23	28

Note: CTE = career and technical education.
Source: Kentucky Center for Education and Workforce Statistics.

High school CTE wage premiums exist even for those who go on to earn a postsecondary degree.

Appendix F shows that high school graduates who completed CTE preparatory course work and went on to earn a postsecondary degree or certificate earned, on average, more than those who completed a postsecondary degree but did not complete CTE preparatory training in high school. For example, the CTE wage premium for graduates who went on to earn a certificate was about $3,700.

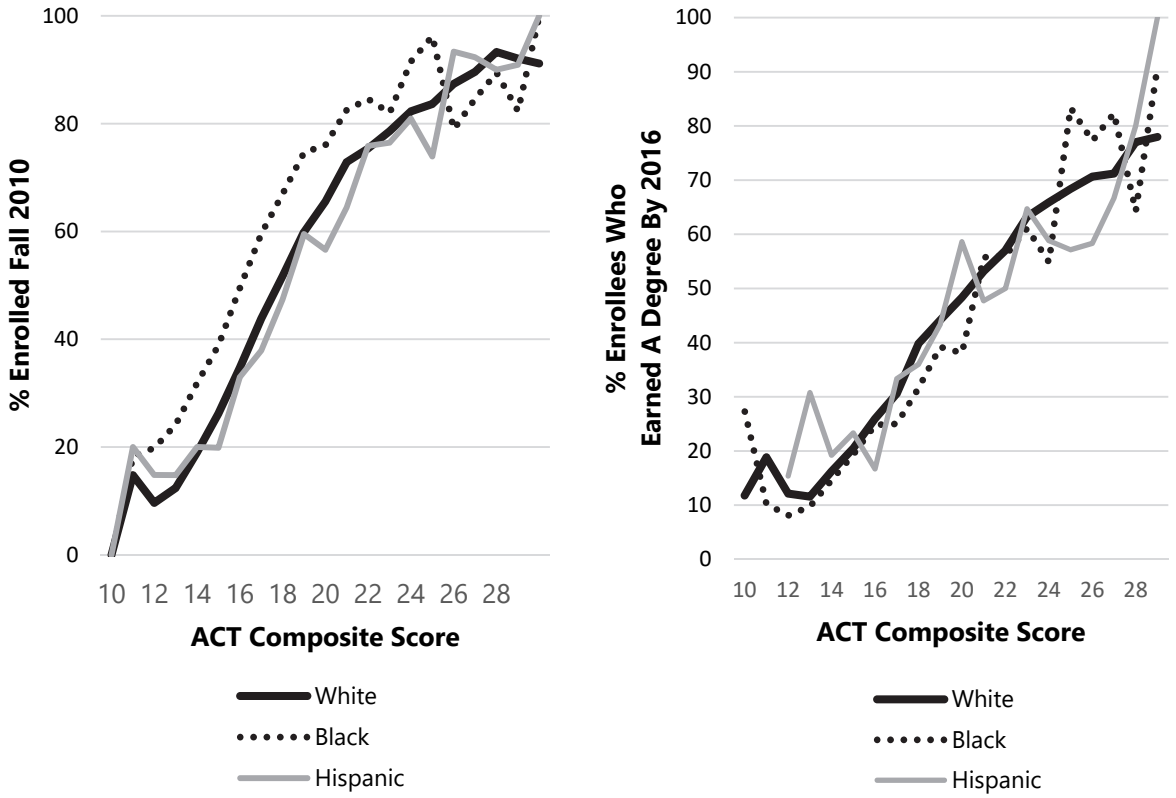
Enrollment And Graduation By Student Demographic Group

Figures 2.H and 2.I show, by ACT composite, the percentage of the class of 2010 who immediately enrolled in postsecondary (in the fall of 2010) and earned an associate's degree or higher by 2016. Figure 2.H shows results by race, and Figure 2.I show results by students' FRPL status. Appendix G shows overall 6-year degree attainment rates by student group and Kentucky workforce region.

Taking ACT scores into consideration, black students enrolled in college at higher rates than white students, but Hispanic students enrolled at lower rates. Among those who enrolled, the percentages of white, black, and Hispanic students who earned a college degree were similar.

Figure 2.H shows that, for most ACT composite scores, black students enrolled in college in the fall of 2010 at a rate that was 10 to 15 percentage points higher than the rate for similarly scoring white or Hispanic students. Hispanic students were slightly less likely than white students and much less likely than black students to enroll in college; however, the percentage of students who enrolled and earned a degree by 2016 was similar for all three groups.

Figure 2.H
Percentage Of 2010 Graduates Enrolled In College, Fall 2010, And Percentage Of Those Graduates Earning A College Degree By ACT And Race

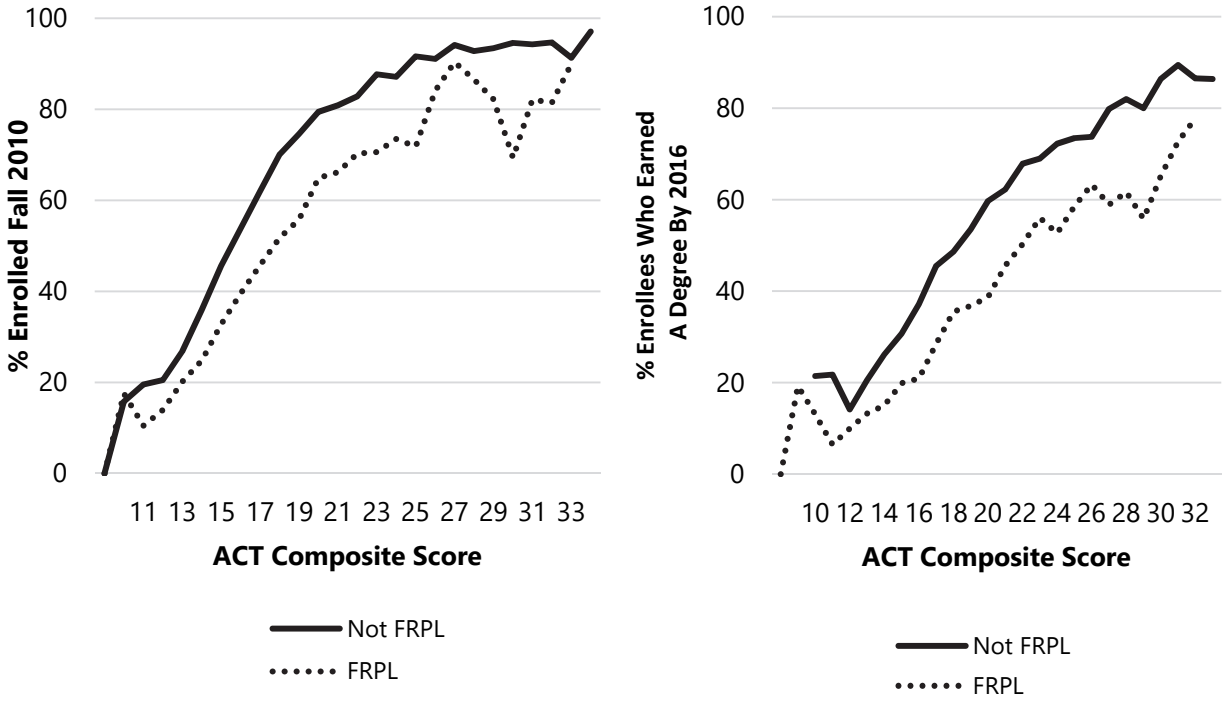


Note: Because of relatively smaller student counts, percentages fluctuate more at the lower and higher ends of the ACT composite score range.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

FRPL students who enrolled in the fall of 2010 earned degrees at a rate that was almost 20 percentage points lower than the rate for similarly prepared non-FRPL students.

Figure 2.I shows substantial differences between FRPL and non-FRPL students in the percentage who enrolled in college in the fall of 2010 and, of those, the percentage who earned a degree within 6 years. Across most ACT achievement ranges, FRPL students who enrolled in the fall of 2010 earned degrees at a rate that was almost 20 percentage points lower than the rate for similarly prepared non-FRPL students. For example, 82 percent of enrolled non-FRPL students with an ACT composite of 30 earned a degree within 6 years compared to only 62 percent of FRPL students with the same ACT composite score.

Figure 2.I
Percentage Of 2010 Graduates Enrolled In College, Fall 2010, And Percentage Of Those Graduates Earning A College Degree By ACT And FRPL



Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Had FRPL high school graduates from the class of 2010 earned college degrees as the same rate as similarly scoring non-FRPL graduates, an additional 2,300 FRPL graduates would have earned college degrees.

Appendix H shows the number, by ACT composite band, of additional FRPL students who would have earned a degree if they had enrolled and graduated at the same rate as similarly qualified non-FRPL peers. Overall, more than 2,300 additional FRPL students would have earned a degree. This would represent an increase of almost 20 percent in the number of class of 2010 graduates who earned a degree by 2016.

Taking college wage premiums into consideration, these additional FRPL college degree earners might have generated an additional $13 million in wages in FY 2016.

Data provided in Chapter 1 showed substantial annual wage premiums, by ACT composite band and high school FRPL eligibility for individuals with and without a postsecondary degree. Appendix H shows the amount of additional wages that might have been generated had FRPL students graduated at the same rate as their similarly qualified non-FRPL peers. These calculations indicate an additional $13 million in wages might have been generated in FY 2016.

Implications Of Class Of 2010 Data For Increasing Degree Attainment

For policy makers concerned about increasing the percentage of Kentucky public school students who earn a college degree, this chapter offers two areas that might be addressed.

Data presented earlier in this chapter show that, while the class of 2010 earned degrees at a rate consistent with the level required by current workforce demand in Kentucky, students in the commonwealth are unlikely at the current rate to close the postsecondary education gap between Kentucky and the nation. For policy makers concerned about increasing the percentage of Kentucky public school students who earn a college degree, this chapter offers two areas that might be addressed in future studies and policies: early identification and acceleration of potential college graduates, and increased attention to supporting FRPL students to persist and graduate from college.

Early Identification And Acceleration

Regulations focus on the senior year of high school to identify and support students not ready for college. This may be too late. Class of 2010 students likely to earn a college degree were college ready in the 11th grade.

Students who score at a composite of 21 or above on the ACT in 11th grade have a good chance of earning a postsecondary degree if they enroll in college, but the majority of Kentucky students do not score at that level. KRS 158.6459 and Kentucky's high school graduation requirements, as described in 704 KAR 3:305, focus on the senior year of high school to accelerate support for students not yet meeting college-readiness benchmarks. As shown in this chapter, however, students meeting college-readiness standards through a combination of measures in the senior year are much less successful in college than those who meet these standards on the ACT in the 11th grade.

Students who are not on track to meet college-readiness standards should be identified and offered acceleration opportunities at the beginning of high school. Less than half of the students who earned proficient scores on 8th-grade state tests went on to earn ACT scores that made them likely to graduate from college.

Students who are not on track to meet college-readiness standards should be identified and offered acceleration opportunities at the beginning of high school. Middle school students who meet proficiency standards on state tests are not necessarily on track to meet academic standards that make them likely to succeed in college. Data shown in Appendix I show that, although most class of 2015 students who scored at the distinguished level on the 8th-grade Kentucky Core Content Test were on track to score at 21 or above on the 11th-grade ACT, most students who scored at the proficient level were not.

College Enrollment And Persistence To Graduation Of FRPL Students

Qualified FRPL students represent an immediately available pool of potential additional college graduates.

As shown earlier in this chapter, students from lower-income families who qualify for FRPL earn college degrees at much lower rates than their similarly qualified peers from higher-income

families. College-ready FRPL students who have not earned degrees thus represent an immediately available pool of potential additional college graduates. Policies aimed at supporting FRPL students to enroll, persist, and graduate from college would not only increase the state's level of educational attainment, they would be an important step in redressing the substantial differences in postsecondary outcomes that are associated with students from lower-income, FRPL-eligible families.

Although it is beyond the scope of this report to discuss specific programs or policies that might increase enrollment and graduation rates of FRPL students, the report does suggest that there are large numbers of academically prepared potential college graduates in the commonwealth, not only from the class of 2010 but also from previous and succeeding classes.

Chapter 3

High School Indicators Of Workforce Outcomes For Students With No Postsecondary Degree

Introduction

This chapter examines the relationship between high school indicators and workforce outcomes for students who did not earn a college degree or certificate.

This chapter examines the relationship between high school indicators and workforce outcomes for students who did not earn a college degree or other certificate. This group is important to understand, as at least one-third of current and future jobs in Kentucky will not require postsecondary education.

Unlike college outcomes, which improve most dramatically as students move into the highest academic achievement ranges, wages for non-degree-earning students improve most dramatically as students move out of the very lowest academic achievement ranges. Indicators that are associated with student behavior—such as attendance and GPA—are more predictive of wages than are ACT scores.

Career and technical education is associated with immediate and sustained wage gains for graduates who complete a preparatory sequence of three CTE courses. In the first year after graduation, CTE completers from the class of 2015 earned 16 percent more than those who did not complete a CTE sequence. CTE graduates who also earned workforce certificates and passed career-readiness academic skills tests earned 41 percent more than graduates who did not complete CTE coursework. Evidence from the class of 2010 suggests that CTE-associated gains are sustained over time; CTE course completers from this class were still earning 18 percent more in 2016 than were graduates who did not complete a CTE sequence. CTE wage premiums are larger for male students than for female students and are greatest for IEP students and students with ACT scores of 14 or below.

Factors such as gender and sector of employment are strongly associated with graduates' wages, independent of the high school indicators analyzed for this study. For example, the discrepancy in CTE wages for male versus female graduates appears to be explained largely by the higher average wages in predominantly male sectors such as manufacturing and construction versus predominantly female sectors such as health or food and accommodations.

Limitations

Data presented in this chapter provide an incomplete view of workforce outcomes for the class of 2010 because they do not include workers who are self-employed, in the military, or working in other states. Depending on the proportion of graduates who are not included in the data analyzed for this report, outcomes may be over- or underestimated. Appendix A shows the percentage of student groups that were included in data for this report. Further, because the unemployment insurance wage data used for this study are reported by quarters and not by hours worked, they do not reveal how much of the apparent differences in wages is explained by full-time versus part-time work.

Class Of 2010 FY 2016 Wages By Highest Educational Attainment Without Degree

Students from the class of 2010 who did not graduate from high school earned an average of $13,227—much less than the average of $19,797 for high school graduates with no postsecondary degree or credential.

Table 3.1 shows the number of individuals from the class of 2010 who were working in 2016 and had not earned a postsecondary degree or credential. The table shows numbers and average wages for those who did not graduate from high school and, for high school graduates, those who never enrolled in postsecondary education and those who enrolled but did not earn a degree. Students from the class of 2010 who did not graduate from high school earned an average of $13,227—much less than the average of $19,797 for high school graduates with no postsecondary degree or credential. Average wages were slightly higher for graduates who never enrolled in college than for graduates who had enrolled but had not earned a degree.[a]

Table 3.1
Average Annual Wages Of Class Of 2010 With No Postsecondary Degree Or Credential By Highest Educational Attainment
FY 2016

Educational Attainment	Number Of Workers	Average Annual Wages, FY 2016
Did not graduate high school	4,275	$13,099
Graduated high school, never enrolled in college	8,176	19,994
Graduated high school, enrolled in college	11,553	19,921
Graduated high school, total	19,729	19,797

Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

[a] Because female students are more likely to enroll in postsecondary education than male students, graduates working without a degree are more likely to be male. Male students were 64 percent of nondegreed graduates who never enrolled in college and 57 percent of those who enrolled but earned no degree.

On average, wages are higher for male than for female workers, for Hispanic than for white or black workers, and for workers who were not eligible for FRPL in high school than for those who were.

Appendix J provides additional FY 2016 data showing wages by student group for 2010 high school graduates without a degree or credential. It shows higher average wages for male than for female workers, for Hispanic than for white or black workers, and for workers who were not eligible for FRPL in high school than for those who were. At $22,774, average male high school graduates' wages were 43 percent higher than average female graduates' wages of $15,870. Hispanic and white graduates ($21,395 and $20,492, respectively) earned substantially more than black graduates ($15,990).

The section that follows focuses on the association between high school indicators and 2016 wages for the entire group of 19,729 graduates from the class of 2010 working in Kentucky without a degree or credential, regardless of whether they were ever enrolled in college.[b]

This chapter does not report relationships between high school indicators and wages for those who did not graduate from high school. OEA's analysis of last available high school indicators and wages for nongraduates suggests that the wages of nongraduates remain substantially lower than those of graduates, regardless of last available high school grades, attendance, or ACT score.

FY 2016 Wages Of 2010 Graduates By Attendance, Disciplinary Incidents, GPA, And ACT

Attendance

Average wages are strongly associated with high school attendance; wages decline as absences increase.

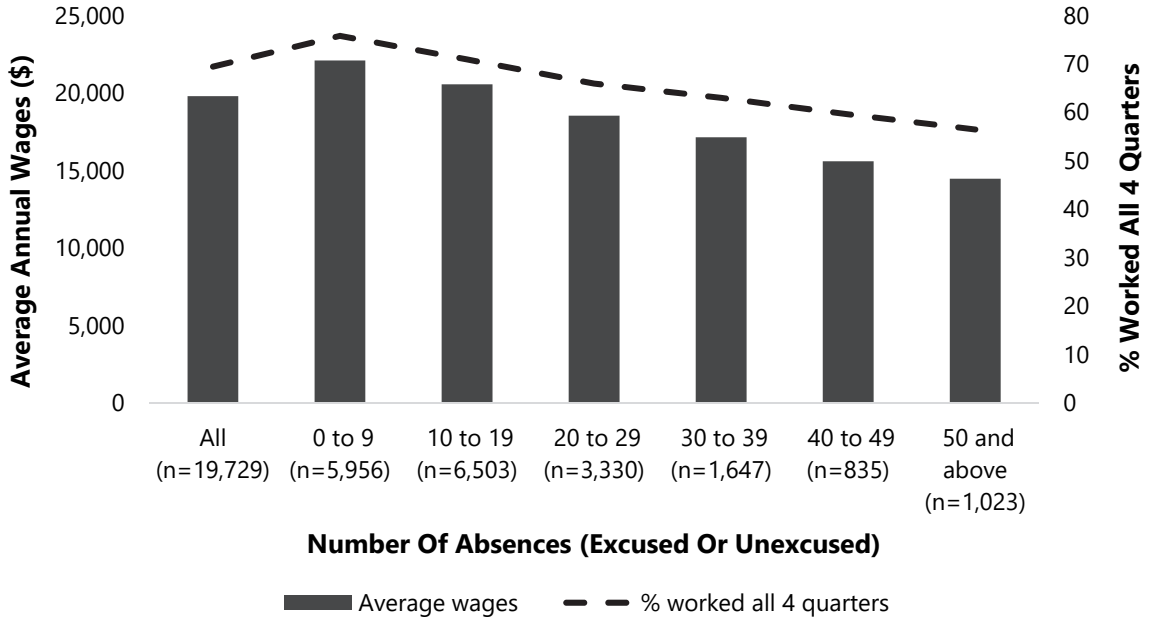
Figure 3.A shows the average FY 2016 annual wages for 2016 graduates by total absent days (excused or unexcused) in 12th grade. Average wages are strongly associated with attendance, declining as student absences increase. Average wages are highest ($22,100) for students with 9 days of absence or less. Approximately 30 percent of graduates working in 2016 were in that category. Graduates in this low-absence category earned an average of over $7,600 more than workers with 50 or more absences. Students are considered chronically absent when absent 10 percent or more of enrolled days (or approximately 18 days in Kentucky).[c]

[b] Major findings reported in this chapter were similar for graduates who never enrolled in college or who enrolled in college and did not earn a degree.
[c] A 2017 study by OEA titled *School Attendance In Kentucky* calculated the chronic absenteeism threshold to be 17.4 days for the state regardless of excused or unexcused status.

Workers who had good attendance in high school were much more likely to work all four quarters of the year than were those who had poor high school attendance.

Figure 3.A also shows, by high school absence range, the percentage of workers employed in all four quarters of FY 2016. As shown in Chapter 1, wages are substantially higher for workers who work all four quarters. Seventy-six percent of workers absent 9 days or less were employed in all four quarters of FY 2016, compared to 57 percent of those absent 50 days or more. This suggests that the relationship between high school attendance and earnings is explained, in part, by the fact that students who attend high school consistently are also more likely to participate consistently in the workforce.

Figure 3.A
FY 2016 Wages And Percentage Worked All Four Quarters
2010 High School Graduates With No Postsecondary Degree Or Credential
By Total Absences In 12th Grade



Note: Total absences are from 12th grade or the last year in which students were enrolled for at least half the school year (95 days or more).
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Disciplinary Incidents

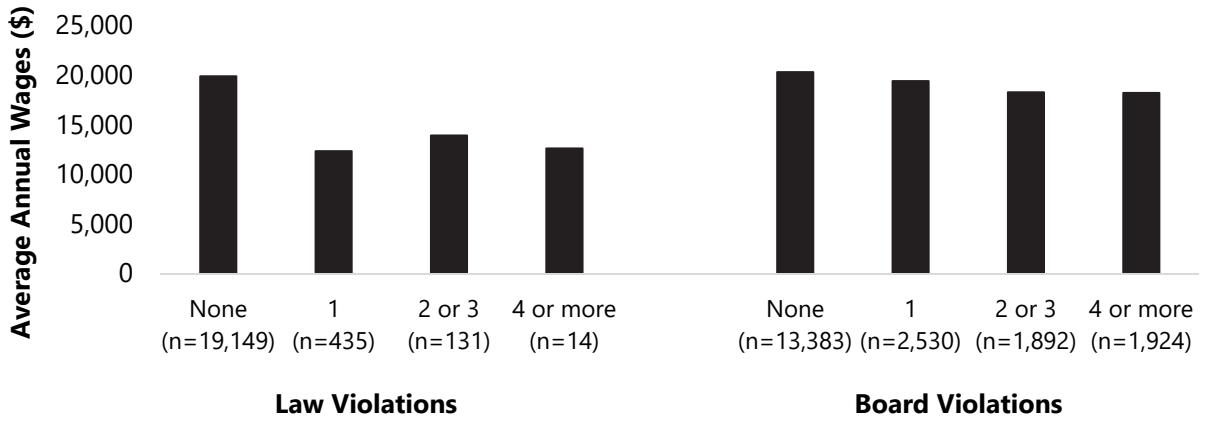
Figure 3.B shows the average annual wages for graduates who received different numbers of disciplinary citations through board or law violations in high school. Board violations are those that subject the student to disciplinary action defined by local school boards. Examples of board violations are cheating, vulgarity, fighting, or skipping school. Law violations are generally more serious and include actions such as robbery, weapons possession,

disorderly conduct, possession of illegal substances, or sexual assault. Board violations are much more common than law violations; about 32 percent of graduates in this analysis committed at least one board violation, compared to less than 3 percent who committed at least one law violation.

Average annual wages are much lower for workers who had one or more law violations in high school but only moderately lower for workers who had one or more board violations.

Figure 3.B shows that, compared to workers who had committed no law violation in high school, average wages were $2,000 lower for those with one law violation and lower by approximately $3,400 more for workers with two law violations in high school. Although average wages are also lower for workers who had committed one or more board violations than for those who had committed none, the decrease is smaller—approximately $900 from no board violations to one board violation and an additional $1,100 for two or three violations. Notably, average wages do not decline for students with four or more board violations.

Figure 3.B
FY 2016 Wages Of 2010 High School Graduates With No Postsecondary Degree Or Credential By Total 11th- And 12th-Grade Board Or Law Violations



Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Positive And Negative Behavior Indicators

For this study, OEA considered high school students to have positive behavior indicators if they were absent 9 days or less and had no board or law violations. Students were considered to have negative behavior indicators if they were absent 18 days or more or had a board or law violation.

Based on findings related to attendance and disciplinary incidents, OEA created "positive" and "negative" behavior indicator categories. These will be used in the sections that follow to show the relationships among behavior, GPA, ACT scores, and wages. OEA identified graduates as having positive behavior indicators if they were absent 9 days or less and had no board or law violations. Graduates were identified as having negative behavior indicators if they were chronically absent (18 days or more) or had one or more board or law violations. Twenty-five percent of graduates working

with no postsecondary degree had positive behavior indicators, and 47 percent had negative indicators. Female graduates were less likely than male graduates to have positive behavior indicators (21 percent versus 27 percent), and FRPL-eligible graduates were less likely than ineligible graduates to have positive behavior indicators (20 percent versus 31 percent).

High School Grades

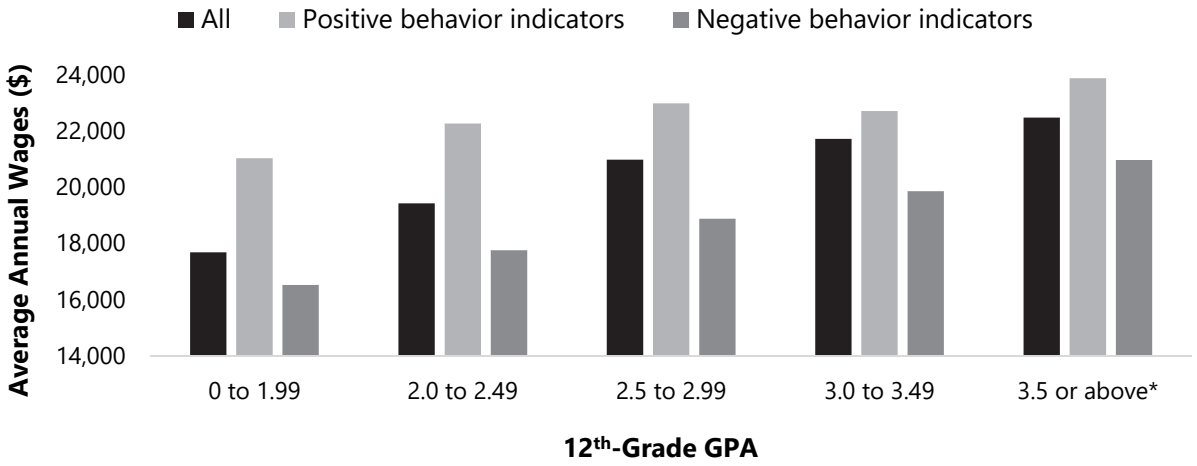
Average wages increase as high school GPA increases. Workers who had very high GPAs in high school earned 1.35 times as much as those with very low GPAs.

Figure 3.C shows that average wages increase as high school GPA increases. Class of 2010 graduates with GPAs of 3.5 or more earned an average of $23,866 in 2016, over $6,000 more than or 1.35 times the average of $17,686 earned by graduates with GPAs of 1.99 or less.

Among graduates with similar GPAs, those with positive behavior indicators earned much more than those with negative behavior indicators.

Positive and negative behaviors are associated with substantial wage differences, even for graduates with similar GPAs. For example, graduates who had GPAs of 2 to 2.49 but positive behavior indicators earned over $4,300 more than students with similar GPAs but negative behavior indicators. As with ACT scores, behavior indicators are associated with greater wage differences in the lower GPA ranges than in the higher ranges. Appendix K provides the values shown in Figure 3.C.

Figure 3.C
FY 2016 Wages Of 2010 High School Graduates With No Postsecondary Degree Or Credential By High School GPA And Behavior Indicators



Note: Positive behavior indicators are absence of 9 days or less and no board or law violations; negative behavior indicators are chronic absence (18 days or more) or at least one board or law violation. Approximately 75 percent of workers met criteria for either positive or negative behavior. GPAs are taken from 12th grade or last available year.
* GPAs in many districts can rise far above 4.0.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

ACT

Figure 3.D shows the average FY 2016 wages for 2010 high school graduates by their 11th-grade ACT composite score, and the average wages for workers with positive and negative behavior indicators within each ACT range. Appendix K provides numbers and values for each group.

Workers with an ACT composite of 14 or less earned approximately $2,000 less than those with an ACT composite of 15 to 17. Average wages for nondegreed workers increase relatively little after ACT scores reach 15.

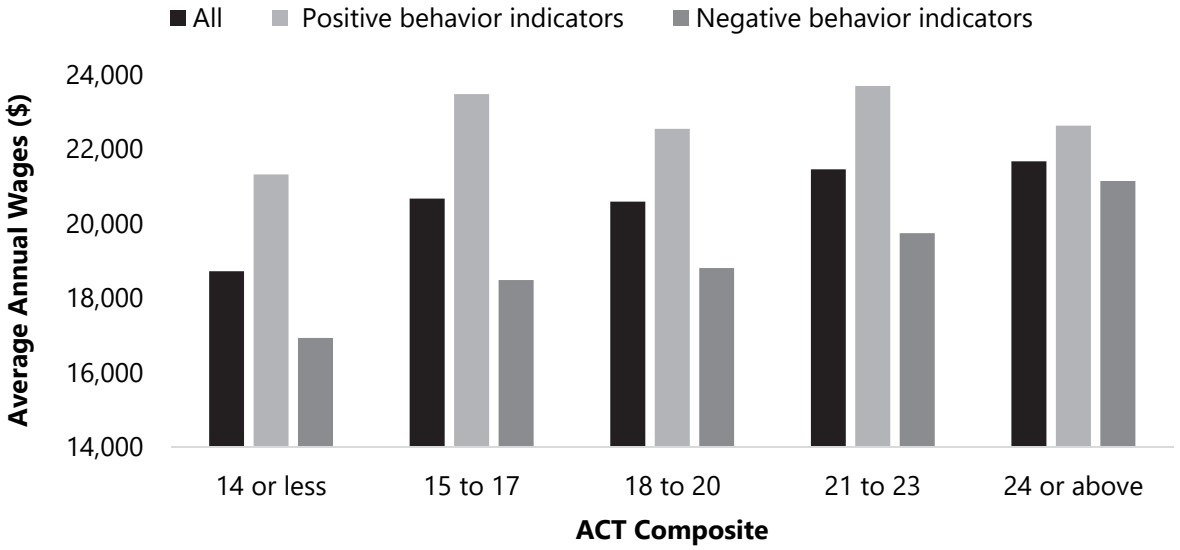
Workers with an ACT composite of 14 or less earned approximately $2,000 less than those with an ACT composite of 15 to 17. Approximately one-third of graduates fall in this lower-achievement category. Unlike college outcomes, postsecondary outcomes for nondegreed workers, as measured by wages, increase relatively little after ACT scores reach 15.[d] Average wages are the same for students with ACT scores of 15 to 17 and those with scores of 18 to 20. Those with scores of 24 or greater earned only about $1,000 more than those with scores of 15 to 17.

Positive versus negative behavior indicators were associated with average wage differences of as much as $5,000 for high school graduates with similar ACT scores.

The difference in average wages within each ACT composite range based on student behavior is much larger than the difference in average wages between ACT composite ranges. For example, workers with ACT composite scores between 15 and 17 with positive high school behavior indicators earned an average of almost $5,000 more than workers in the same ACT composite range with negative high school behavior indicators. Workers in the ACT composite range of 18 to 20 did not earn more than workers in the 15 to 17 range. The difference in wages between positive and negative behavior indicators is greatest for graduates in the lowest ACT composite ranges and is relatively small for students with ACT composite scores of 24 or above.

[d] As shown in Appendix K, the relationship between ACT scores and wages differ by gender. Whereas average wages are not substantially higher for males with scores above 15, they are higher for females.

Figure 3.D
FY 2016 Wages Of 2010 High School Graduates
With No Postsecondary Degree Or Credential
By ACT Composite And High School Behavior Indicators



Note: Positive behavioral indicators are absence of 9 days or less and no board or law violations; negative behavioral indicators are chronic absence (18 days or more) or at least one board or law violation. Approximately 75 percent of workers met criteria for positive or negative behavior.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

To the extent that education metrics exclude behavioral measures, they are failing to capture what are clearly powerful indicators of future student success.

Researchers and policy makers are beginning to acknowledge that, to the extent that education metrics exclude behavioral measures, they are failing to capture what are clearly powerful indicators of future student success.[e] Many states and districts have responded to findings such as those reported above by implementing programs to teach and measure social-emotional skills. Some are incorporating student engagement or social emotional skills into their accountability systems to fulfill federal requirements for a nonacademic indicator.[8] Experts warn, however, that "[t]he embrace of soft skills by education reformers is well in advance of the development of conceptual, instructional, measurement, and accountability models of soft skills that are appropriate to education settings."[9] Nevertheless, it is worth noting that while standardized tests like the ACT are the most reliable instruments available for measuring educational outcomes, they may be less predictive of

[e] For example, Schanzenbach et al. note that, to the extent that schools focus largely on cognitive versus noncognitive skills, "the education system may not be focused on the skills that are in demand now and are likely to be in demand in the future." Diane Whitmore Schanzenbach, Ryan Nunn, Lauren Bauer, Megan Mumford, and Audrey Breitwieser. *Seven Facts On Noncognitive Skills From Education To the Labor Market.* Washington: Brookings Institute, 2016. P. 1.

future success than behavioral variables for graduates holding jobs that do not require a postsecondary degree.

Career And Technical Education

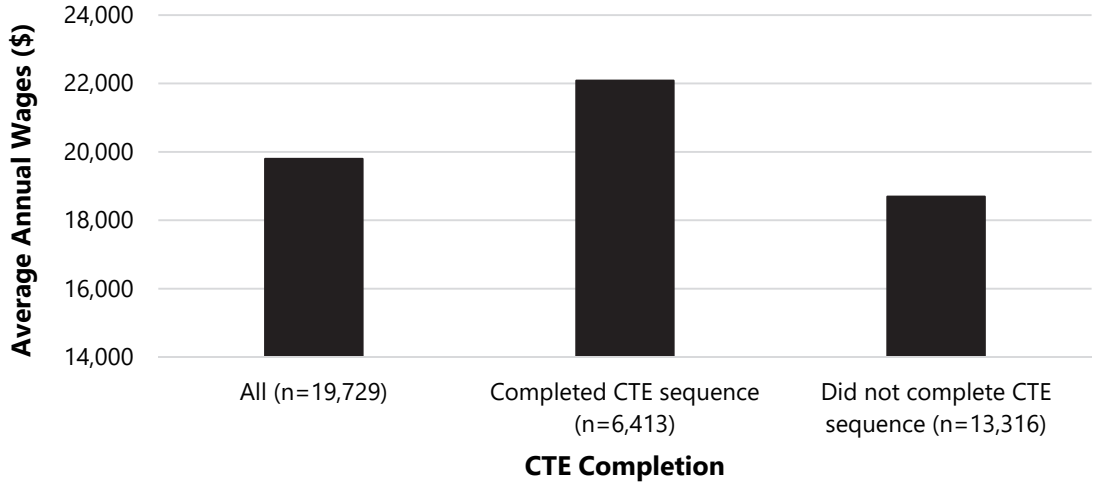
This section analyzes CTE wage premiums for 2010 and 2015 graduates and how these premiums vary based on student characteristics and workforce sector. The section focuses primarily on outcomes for the class of 2010 because those students can be tracked for 6 years following graduation. Wage data for 2015 graduates provide preliminary data on wage premiums for the career-readiness indicator, which includes academic and work-skills tests, in addition to CTE.

Class Of 2010

Average FY 2016 wages were 18 percent higher for 2010 graduates who completed a preparatory sequence of three CTE courses in high school than for those who did not.

CTE Wage Premium. Figure 3.E shows that average FY 2016 earnings were approximately $3,400 or 18 percent higher for 2010 graduates who completed a preparatory sequence of three CTE courses in high school than for graduates who did not complete a CTE sequence.

Figure 3.E
FY 2016 Wages Of 2010 High School Graduates With No Postsecondary Degree Or Credential By High School CTE Completion

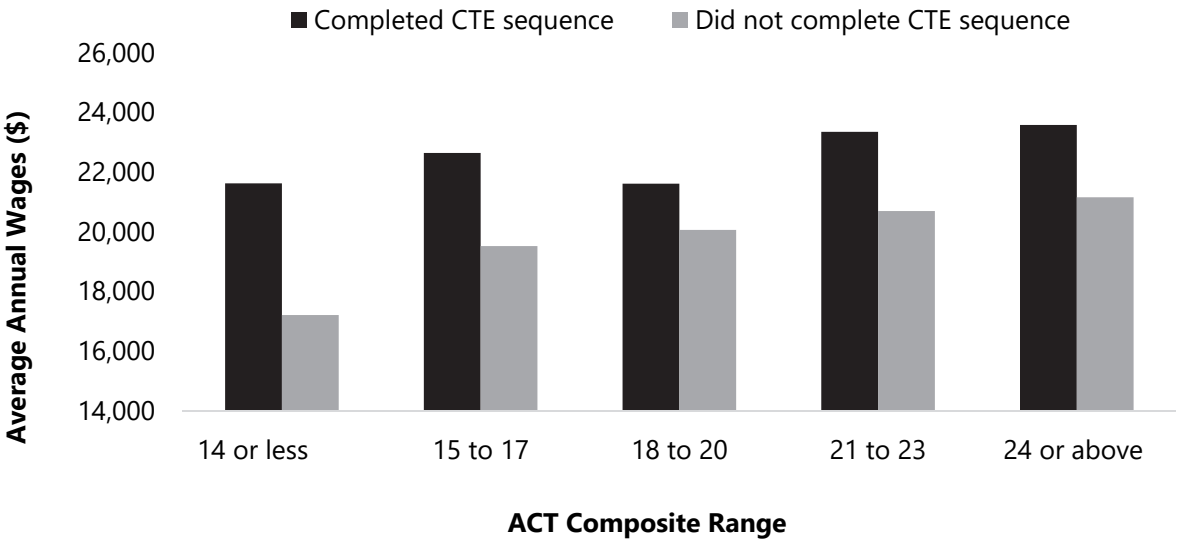


Note: The group that did not complete a CTE sequence includes both those who did not enroll in any CTE courses and those who enrolled but did not complete a sequence of three courses.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Average CTE wage premiums are greatest for academically low-achieving graduates—those with an ACT composite of 14 or less—but less than one-third of these graduates complete CTE preparation.

Wage Premiums By ACT. Figure 3.F shows wages for CTE completers and noncompleters by ACT score. Regardless of ACT score, CTE completers earned more than the average of about $19,800 for all nondegreed graduates. Average CTE premiums were greatest for graduates with an ACT composite of 14 or less. CTE completers in this category earned an average of $21,626 more—over $4,400 more, an increase of 26 percent—than similarly scoring graduates who did not complete a CTE sequence. CTE wage premiums were smaller in the higher ACT ranges.

Figure 3.F
FY 2016 Wages Of 2010 High School Graduates With No Postsecondary Degree Or Credential By ACT Composite And CTE Completion



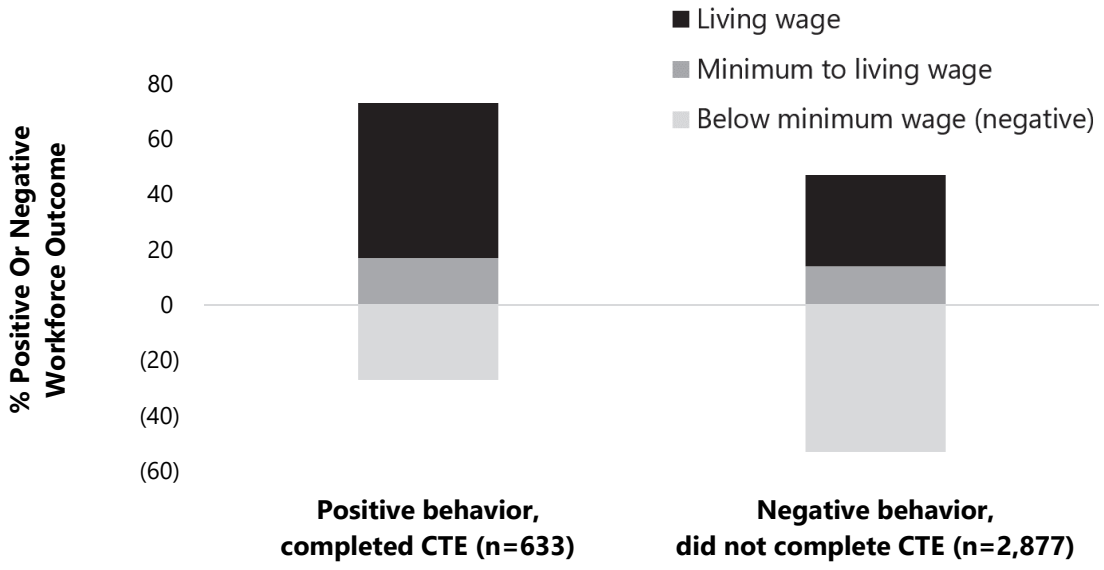
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Given the higher CTE premiums for academically lower-achieving graduates, access to CTE appears especially important for this group. Appendix L shows recent data on CTE completion of 2015 graduates. Less than one-third of graduates with ACT scores of 14 or less completed CTE, and rates varied substantially among regions, from 18 percent in the Kentuckiana region, which includes Jefferson County, to 50 percent in the Big Sandy region of Eastern Kentucky.

CTE wage premiums are even greater for graduates with positive behavior indicators. Although the average salary for 2010 CTE completers was approximately $22,100, the average salary for CTE completers with positive behavior indicators was approximately $24,400.

Premiums for CTE and positive behavior are substantial, even for graduates with ACT scores far below the state average. Combining CTE and behavior wage premiums, Figure 3.G contrasts wages of 2010 graduates with below-average ACT scores of 15 who completed CTE preparation and had positive behavior indicators with those who did not complete CTE and had negative behavior indicators. Graduates with positive behavior who completed CTE training were much more likely to be earning a living wage than were those with negative behavior who did not complete CTE training (56 percent versus 33 percent, respectively), and they were half as likely to be working for the annual equivalent of less than minimum wage.

Figure 3.G
FY 2016 Wages Of 2010 High School Graduates
With No Postsecondary Degree Or Credential And ACT Composite Of 15
By High School CTE Completion And Behavior Indicators



Note: Positive behavioral indicators are absence of 9 days or less and no board or law violations; negative behavioral indicators are chronic absence (18 days or more) or at least one board or law violation. Approximately 75 percent of workers met criteria for positive or negative behavior. Wages equivalent to minimum wage are $15,080, and wages equivalent to living wage are $21,153.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

CTE wage premiums varied among student groups; for example, the CTE wage premium was much higher for male workers than female workers.

Wage Premiums By Student Group. Table 3.2 shows that CTE wage premiums varied substantially among student groups. The CTE premium of $4,913 for male graduates was nearly six times as great as the premium of $828 for female graduates. The premium of $6,236 for Hispanic graduates was more than twice the premium of

$3,042 for white graduates and more than 2½ times the premium of $2,427 for black graduates. The CTE premium of $4,696 for IEP students who completed a CTE sequence is a 31 percent increase over the average wages of $15,176 for IEP students who did not complete a CTE sequence.

Black and Hispanic graduates completed CTE sequences at rates that were much lower (18 percent and 24 percent, respectively) than the rate for white graduates (35 percent).

The table also shows the percentage of nondegreed graduates working in 2016 who had completed a preparatory sequence. Whereas the percentage of workers who had completed a CTE sequence was similar for male and female graduates and for FRPL and non-FRPL graduates, black and Hispanic graduates completed CTE training at rates that were much lower (18 percent and 24 percent, respectively) than the rate for white graduates (35 percent).

Table 3.2
FY 2016 Wages Of 2010 High School Graduates With No Postsecondary Degree Or Credential By CTE Completion And Student Group

			Average Annual Wages		
Student Group	Number Of Students	Percent Completed CTE Preparatory Sequence	Completed CTE Course Sequence	Did Not Complete CTE Course Sequence*	Difference
All	19,729	33	$22,088	$18,694	$3,394
Female	8,482	31	16,441	15,613	828
Male	11,222	34	26,036	21,123	4,913
Black	2,825	18	17,985	15,558	2,427
Hispanic	324	24	26,129	19,893	6,236
White	16,116	35	22,461	19,418	3,042
IEP	1,581	34	19,872	15,176	4,696
FRPL	11,825	32	20,422	17,097	3,326
Not FRPL	7,904	33	24,022	20,593	3,428

Note: Some figures do not sum due to missing data for some variables. CTE = career and technical education; IEP = individualized education program; FRPL = free or reduced-price lunch.
*This group includes both those who did not enroll in any CTE courses and those who enrolled but did not complete a sequence of three courses.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Wage Premiums By Workforce Sector. Table 3.3 shows the number and percentage of 2010 graduates working in sectors that employed at least 100 individuals from the class, along with the CTE wage premiums for each sector.

Wage premiums associated with completing CTE courses varied among work sectors, from $4,580 in construction to $34 in accommodation and food services.

CTE wage premiums were highest ($4,580) for those working in the construction sector, which is a relatively high-wage sector that employed 5 percent of nondegreed workers from the class of 2010. Premiums varied among the other sectors. For example, in the most

common sectors (those employing 10 percent or more of workers), premiums were $2,148 in manufacturing (15 percent of workers), $2,145 in administrative support and waste management (14 percent of workers), $1,353 in retail trade (16 percent of workers), $696 in health care and social assistance (10 percent of workers), and only $34 in accommodation and food services (15 percent of workers). Note that, according to staff calculations, most workers who completed CTE training did not complete it in a career cluster that aligned exactly with their sector of employment. For example, of the manufacturing workers who had completed a CTE sequence, less than one-fifth had completed CTE in a manufacturing cluster.

Table 3.3
FY 2016 Wages Of 2010 High School Graduates With No Postsecondary Degree Or Credential By CTE Completion And Workforce Sector

	Sector Employment		Wages		
Workforce Sector	Number	Percent	Completed CTE Preparatory Sequence	Did Not Complete CTE	Difference
Accommodation, food services	2,995	15	$12,236	$12,202	$34
Administrative support and waste management	2,824	14	14,780	12,635	2,145
Arts, entertainment, recreation	142	1	14,372	12,551	1,821
Construction	957	5	30,201	25,621	4,580
Educational services	310	2	17,007	14,817	2,190
Finance and insurance*	509	3	23,895	24,262	-367
Health care, social assistance	1,925	10	17,696	17,000	696
Information	329	2	24,110	22,771	1,340
Manufacturing	2,878	15	33,699	31,551	2,148
Services other than public administration	498	3	21,534	17,830	3,704
Professional, scientific, and technical services	523	3	20,645	18,788	1,857
Public administration	437	2	25,959	25,292	667
Real estate, rental, leasing	194	1	24,944	20,913	4,031
Retail trade	3,115	16	16,906	15,553	1,353
Transportation, warehousing	991	5	27,013	22,743	4,270
Wholesale trade	626	3	27,985	24,377	3,609
Total/average	19,253		$22,088	$18,694	$3,394

Note: Some figures do not sum due to rounding.
*CTE-completing graduates working in finance earned over $4,000 more than those who did not complete CTE.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

The highest-paying sectors of manufacturing, construction, and transportation employed a much higher percentage of male workers than female workers. The lower-paying sectors of health care and accommodation and food service employed a much higher percentage of female workers than male workers.

Table 3.4 shows average FY 2016 wages for graduates working in the highest- and lowest-paying major sectors (those that employed more than 100 graduates) and the percentage of workers by gender. Of sectors that employed more than 100 graduates, the highest-paying sectors of manufacturing, construction, and transportation employ a much higher percentage of male workers than female workers whereas the lower-paying sectors of health care and accommodation and food service employ a higher percentage of female workers. Finance and insurance is the only higher-paying sector that employs a greater percentage of female workers than male workers.

Table 3.4
FY 2016 Wages Of 2010 High School Graduates
With No Postsecondary Degree Or Credential By Workforce Sector
And Percentage Of Sector Workers By Gender

Wage Group	Industry Sector	Average Annual Wages	Percent Of Sector Workers Female	Percent Of Sector Workers Male
Lower wages	Accommodation and food services	$12,211	53.9%	46.1%
	Administrative and support and waste management and remediation services	13,195	38.0	62.0
	Health care and social assistance	17,243	83.7	16.3
	Retail trade	15,990	49.9	50.1
Higher wages	Construction	27,497	3.7	96.3
	Finance and insurance	24,142	79.0	21.0
	Manufacturing	32,374	20.7	79.3
	Transportation and warehousing	24,027	24.4	75.6

Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Appendix M shows the ratio of the percentage of women and percentage of men employed in each sector. Women were 1.6 times as likely as men to be employed in the accommodation and food services sector and more than six times as likely as men to be employed in health services; conversely, men were 3 times as likely as women to be employed in manufacturing and 20 times as likely as women to be employed in construction.

Relative Effects Of High School Indicators, Versus Other Factors, On Wages. Appendix N uses statistical modeling to weight the degree to which high school indicators, student demographic characteristics, and workforce sectors account for wages of 2010 graduates. The analysis shows that sector of employment and gender are much greater predictors of wages than any of the high school indicators analyzed in this study. Holding GPA, attendance, behavior, race, and FRPL as constants, males

earn, on average, $4,381 more than females and graduates working in construction, manufacturing, and mining earn, on average, $12,807 more than those in other sectors.

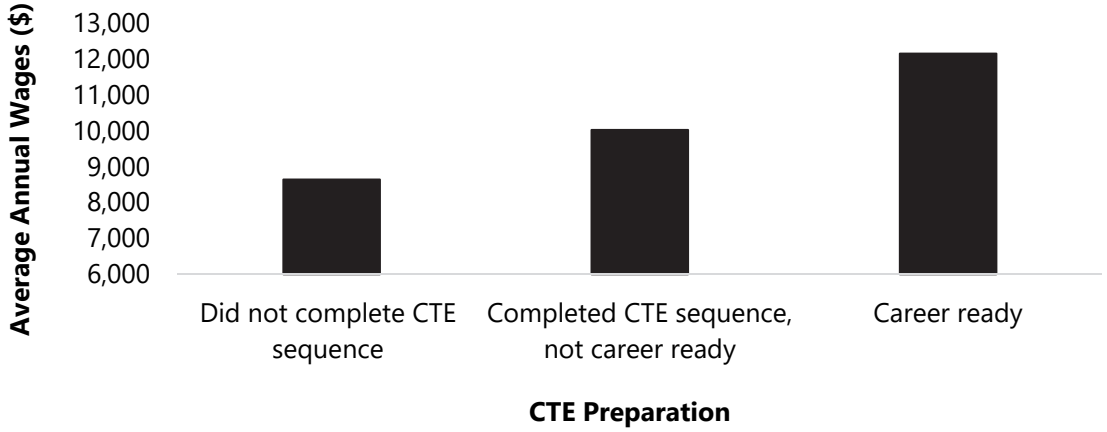
High school indicators do matter, however. Independent of student demographic characteristics and sector of employment, the following are associated with higher wages: completion of CTE (a difference of almost $2,000), GPA of 3.0 or greater (approximately $1,500), having an ACT greater than 14 (approximately $1,400), and being absent less than 18 days (approximately $1,300). Having a law violation was associated with wage decreases of over $2,000.

Class Of 2015 Career-Readiness Wage Premiums

As with class of 2010 graduates, average wages for class of 2015 graduates were greater (by 16 percent) for those who had completed a CTE sequence. Those who had met all of the requirements to be considered career ready earned 41 percent more than those who did not complete a CTE sequence.

Figure 3.H shows the average FY 2016 wages of 2015 graduates who were not enrolled in any postsecondary education, by their level of CTE preparation. Those who completed a sequence of three preparatory courses earned an average of just over $10,000, almost $1,400 or 16 percent more than those who did not complete a sequence. Graduates who met criteria for being career ready—meaning that, in addition to completing a CTE sequence, they earned a KOSSA or industry certificate in a related field and passed a career-readiness academic test—earned an additional $3,500, or 41 percent, more than graduates who did not complete a CTE sequence.

Figure 3.H
FY 2016 Wages Of 2015 High School Graduates With No Postsecondary Degree Or Credential By CTE Preparation



Note: To be career ready, a graduate must earn an industry certificate and pass a career-readiness academic test, in addition to completing a CTE preparatory sequence.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Patterns in wages by sector for 2015 graduates were similar to those for 2010 graduates; average wages of those employed in manufacturing, construction, transportation, and finance were much higher than average wages in health, administration, and food and accommodation.

Appendix O shows 2015 graduates' CTE wage premiums by workforce sector. As with 2010 graduates, wages and CTE premiums of 2015 graduates employed in manufacturing, construction, transportation, and finance were, on average, higher than wages and CTE premiums for those employed in health, administration, and food and accommodation. Together, administration and food and accommodation employed 42 percent of recent graduates.

Conclusion

Taken together, findings from Chapters 2 and 3 suggest some different critical considerations for the high school education of students who intend to pursue postsecondary education versus those who intend to enter the workforce directly. The likelihood of earning a college degree increases sharply with ACT scores; it is only at an ACT composite of 21 that a graduate becomes likely to earn a degree. For high school graduates entering the workforce directly, CTE preparatory courses, behavior indicators, and career-readiness skills as demonstrated by industry certifications and career-readiness academic tests appear more important than college-readiness academic ability as demonstrated on the ACT.

The new accountability system that KDE has proposed for implementation in the 2018-2019 school year recognizes a variety of ways in which graduates can be considered successful in postsecondary transitions and in which schools can be recognized for providing opportunities for success. This study reinforces the importance of tailoring high school education to meet the needs of students with different postsecondary intentions.

The study also supports the Kentucky Department of Education's stated intention to review the minimum graduation requirements contained in 704 KAR 3:305. This review should consider whether the current regulation allows schools and districts sufficient flexibility to meet the needs of students with different postsecondary goals. For example, the requirements in Section 2(1)(b) and Section 2(3)(d) that students take transitional courses based on CPE college-readiness benchmarks might be broadened to allow for transitional courses for students not meeting career-readiness academic standards. In addition—given strong evidence that students who directly enter the workforce benefit from a sequence of CTE classes—it is worth investigating whether the course credits as currently described align well with the goal of providing CTE education. For example, the requirement in

Section 2(3)(a) that students take algebra II in order to graduate may align more closely with some CTE training clusters than with others. This math requirement might be broadened to allow for better alignment with a variety of career clusters.

Recommendation 3.1

Recommendation 3.1

The Kentucky Department of Education should examine the minimum high school graduation requirements outlined in 704 KAR 3:305, sec. 2 to determine whether those requirements offer local districts and schools sufficient flexibility to tailor high school programs to meet the needs of students with different postsecondary goals.

Finally, while this report relies primarily on postsecondary degree and wage data to assess the relationship between high school indicators and postsecondary success, it is important to reiterate the limitations of these data as a means of determining the comprehensive value of high school education. These limitations go beyond data concerns, such as lack of detailed and comprehensive wage data. It is clear that workforce patterns and student demographic characteristics are influencing both wages and degree attainment far beyond what can be predicted from high school indicators. Also, while postsecondary degree and wage data are critically important indicators in assessing the long-term outcomes associated with elementary and secondary education, they are also incapable of capturing many of the eight capacities that represent the broad goals of Kentucky's public education system. As stated in KRS 158.645, these capacities include qualities such as mental and physical wellness; appreciation of cultural and historical heritage; good character; understanding of governmental institutions; and ability to make economic, social, and political choices.

Appendix A

Broad Outcomes, Class Of 2010

Percentages shown in Table A.1 are calculated as a percentage of students who were located in data through 2016 and not enrolled that year in postsecondary education. Table A.2 reports percentages, by student group, that are included in the outcomes reported in Table A.1.

Table A.1
Class Of 2010 Broad Outcomes By Student Group Through 2016

			Percent Of Class By Outcome				
				No College Degree			
	Student Group	Number Of Students	Not Reported Graduated	Working Below Minimum Wage	Minimum Wage To Living Wage	Living Wage	Associate's Or Above
Race	All	40,989	19	21	8	21	30
	Black	4,969	26	31	9	18	16
	Hispanic	777	30	17	6	20	27
	White	33,904	18	20	8	21	32
Gender	Female	19,715	17	23	9	14	37
	Male	21,236	22	20	8	27	24
Program Eligibility	FRPL	20,839	26	28	10	21	14
	Not FRPL	20,139	12	15	7	20	46
	IEP	2,198	19	38	13	25	6
	LEP	263	46	19	4	17	13
	Homeless	1,895	39	33	9	14	6

Note: Some figures do not sum due to missing data for some variables. FRPL = free or reduced-price lunch; IEP = individualized education program; LEP = limited English proficiency.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Table A.2
Percentage Of Student Groups Included In Broad Outcome Data Reported In Table A.1

Student Group	Number Of Students	Enrolled In Postsecondary Education In 2016, No Degree Yet	Outcome Not Located In Data Through 2016	Included In Outcome Data
All	53,434	6	17	77
Black	6,370	7	15	78
Hispanic	1,217	7	29	64
White	44,032	6	17	77
Female	25,756	7	16	77
Male	27,623	6	17	77
FRPL	27,917	6	20	75
Not FRPL	25,517	7	14	79
IEP	3,368	3	32	65
LEP	470	4	40	56
Homeless	2,525	4	21	75

Note: FRPL = free or reduced-price lunch; IEP = individualized education program; LEP = limited English proficiency.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Appendix B

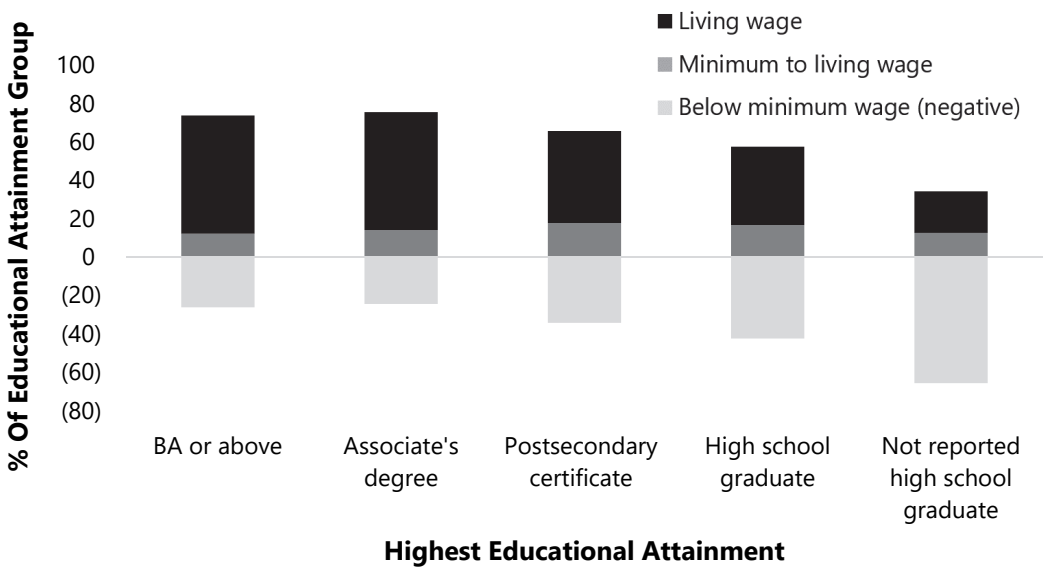
Class Of 2010 High School Indicators And Incarceration Rates

High School Indicator	Number Of Students	Incarcerated	Percent Of Subgroup Incarcerated	Percent Of Class In Subgroup And Incarcerated
All students	53,434	1,596	3.0	3.0
Three or more mobility events	1,309	293	22.4	0.5
One or more law violations	1,373	151	11.0	0.3
Not reported as high school graduate	7,941	797	10.0	1.5
Homeless	2,525	230	9.1	0.4
One or more board violations	14,076	689	4.9	1.3
ACT score of 14 or less	12,061	554	4.6	1.0

Note: Mobility calculation included enrollment codes for students entering a school from another Kentucky school. It is possible that some of these students are transferring from alternative schools rather than moving school locations.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Appendix C

Class Of 2010 Average Annual FY 2016 Wage Categories By Educational Attainment



Note: This figure includes any individual who was ever part of the class of 2010 who was working in 2016 and not enrolled in any Kentucky postsecondary education. Outcomes considered to be negative are reported below zero. The absolute value of percentages reported total 100.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Appendix D

Postsecondary Degree Wage Premiums By FRPL And ACT

Average FY 2016 Wages Of 2010 Graduates By Postsecondary Degree Of Associate's Or Above High School FRPL And ACT

		Wages			
High School FRPL Status	11th-Grade ACT Composite	No Postsecondary Degree	Postsecondary Degree	Difference	Percent Gain
FRPL	14 or below	$17,346	$22,213	$4,867	28%
	15 to 17	19,295	23,459	4,164	22
	18 to 20	19,198	25,342	6,143	32
	21 to 23	19,940	27,387	7,448	37
	24 or above	21,481	26,866	5,384	25
Not FRPL	14 or below	22,009	22,512	503	2
	15 to 17	22,711	25,802	3,090	14
	18 to 20	22,090	27,202	5,112	23
	21 to 23	22,647	27,693	5,045	22
	24 or above	21,792	29,322	7,530	35

Note: Some figures do not sum because of rounding. FRPL = free or reduced-price lunch.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Appendix E

Percentage Of 2010 Graduates Earning A Postsecondary Degree By 2016 By ACT and GPA

Table E.1
2010 Graduates Earning Associate's Degree Or Above By 2016 By 12th-Grade GPA

GPA	Number	Percent
Less than 2	135	1
2 to 2.49	447	4
2.5 to 2.99	1,407	12
3.0 to 3.49	3,820	32
3.5 or above	6,295	52

Note: This analysis excluded 260 graduates because of data concerns. When 12th-grade GPA (grade point average) was not available, 11th-grade GPA was used.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Table E.2
2010 Graduates Earning Associate's Degree Or Above By 2016 By ACT Composite

ACT Composite	Number	Percent
14 or less	412	3
15 to 17	1,552	13
18 to 20	2,845	23
21 to 23	2,948	24
24 or above	4,402	36

Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Appendix F

High School CTE Wage Premiums For College Graduates

FY 2016 Wages Of 2010 Graduates With Postsecondary Degree Or Certificate By Completion Of CTE Preparatory Course In High School

	Number		Wages		
Degree	Completed	Did Not Complete	Completed	Did Not Complete	Difference
Bachelor's or above	3,229	1,024	$28,486	$26,752	$1,734
Associate's	688	510	29,399	26,405	2,994
Certificate	512	424	24,608	20,892	3,717

Note: Some figures do not sum because of rounding.
Source: Staff analysis of data from the Kentucky Department of Education And Workforce Statistics.

Appendix G

College Readiness, College Enrollment, And Degrees Earned By Student Group And Area Development District

Table G.1
Percent Of 2010 Graduates Who Met ACT College-Readiness Benchmarks In 11th Grade And Percentage Earning An Associate's Degree Or Above By 2016 By Student Group

Category	Number Of Students	Percent Met All College-Readiness Benchmarks On 11th-Grade ACT	Percent Associate's Degree Or Above By 2016
All	45,493	22	27
Female	22,390	24	32
Male	23,056	20	21
Asian	484	39	49
Black	5,084	7	15
Hispanic	987	17	21
White	37,929	24	28
IEP	2,958	4	4
LEP	348	*	9
Homeless	1,794	6	6
FRPL	22,421	11	13
Not FRPL	23,072	33	40

Note: IEP = individualized education program; LEP = limited English proficiency; FRPL = free or reduced-price lunch.
* <10 students; redacted.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Table G.2
Percentage Of 2010 Graduates
Who Met ACT College-Readiness Benchmarks In 11th Grade
And Percentage Who Earned An Associate's Degree Or Above By 2016
By Area Development District

Area Development District	Number Of Students	Percent Met All College-Readiness Benchmarks On 11th-Grade ACT	Percent Associate's Degree Or Above By 2016
Barren River	3,197	23	27
Big Sandy	1,901	15	26
Bluegrass	7,474	26	31
Buffalo Trace	794	19	26
Cumberland Valley	2,759	17	22
FIVCO	1,537	20	29
Gateway	858	19	26
Green River	2,270	23	30
Kentucky River	1,319	15	22
KIPDA	8,973	22	25
Lake Cumberland	2,290	18	23
Lincoln Trail	3,201	22	25
Northern Kentucky	4,274	27	30
Pennyrile	2,321	20	24
Purchase	2,301	25	29
State total	45,493	22	27

Note: Students enrolled in a district less than 100 days are not attributed to any district. Those students are included in the state total only.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Table G.3
Percentage Of 2010 Graduates Who Enrolled In College Fall 2010
And Percent Of Those Who Earned An Associate's Degree Or Above By 2016
By FRPL Eligibility And Area Development District

		Met All College-Readiness Benchmarks On 11th-Grade ACT		Enrolled In Fall 2010		Percent Of Fall 2010 Enrollees Associate's Or Above By 2016	
Region	Percent Of All Graduates FRPL	Not FRPL	FRPL	Not FRPL	FRPL	Not FRPL	FRPL
Barren River	49	34	12	71	39	56	29
Big Sandy	60	25	9	74	47	51	31
Bluegrass	41	37	11	72	42	57	31
Buffalo Trace	55	29	12	67	39	58	30
Cumberland Valley	68	32	10	73	43	53	31
FIVCO	51	31	9	73	42	58	31
Gateway	57	29	11	76	40	56	29
Green River	47	32	12	71	43	59	33
Kentucky River	73	26	11	78	49	54	28
KIPDA	46	34	8	67	39	53	27
Lake Cumberland	63	31	10	74	42	56	29
Lincoln Trail	45	30	13	67	42	52	25
Northern Kentucky	38	35	14	69	40	57	30
Pennyrile	48	28	12	66	39	53	26
Purchase	53	37	15	75	45	57	28
State	49	33	11	70	42	55	29

Note: FRPL = free or reduced-price lunch.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Table G.4
School Districts Included In Area Development Districts

Area Development District	School Districts
Barren River	Allen, Barren, Bowling Green Ind, Butler, Caverna Ind, Edmonson, Glasgow Ind, Hart, Logan, Metcalfe, Monroe, Russellville Ind, Simpson, Warren
Big Sandy	Floyd, Johnson, Martin, Magoffin, Paintsville Ind, Pike, Pikeville Ind
Bluegrass	Anderson, Berea Ind, Bourbon, Boyle, Burgin Ind, Clark, Danville Ind, Estill, Fayette, Frankfort Ind, Franklin, Garrard, Harrison, Harrodsburg Ind, Jessamine, Lincoln, Madison, Mercer, Nicholas, Paris Ind, Powell, Scott, Woodford
Buffalo Trace	Augusta Ind, Bracken, Fleming, Lewis, Mason, Robertson
Cumberland Valley	Barbourville Ind, Bell, Clay, Corbin Ind, East Bernstadt Ind, Harlan, Harlan Ind, Jackson, Knox, Laurel, Middlesboro Ind, Pineville Ind, Rockcastle, Whitley, Williamsburg Ind
FIVCO	Ashland Ind, Boyd, Carter, Elliott, Greenup, Fairview Ind, Lawrence, Raceland-Worthington Ind, Russell Ind
Gateway	Bath, Menifee, Montgomery, Morgan, Rowan
Green River	Daviess, Hancock, Henderson, McLean, Ohio, Owensboro Ind, Providence Ind, Union, Webster
KIPDA	Anchorage Ind, Bullitt, Eminence Ind, Henry, Jefferson, Oldham, Shelby, Spencer, Trimble
Kentucky River	Breathitt, Hazard Ind, Jackson Ind, Jenkins Ind, Knott, Lee, Leslie, Letcher, Owsley, Perry, Wolfe
Lake Cumberland	Adair, Campbellsville Ind, Casey, Clinton, Cumberland, Green, McCreary, Monticello Ind, Pulaski, Russell, Science Hill Ind, Taylor, Somerset Ind, Wayne
Lincoln Trail	Bardstown Ind, Breckinridge, Cloverport Ind, Elizabethtown Ind, Grayson, Hardin, LaRue, Marion, Meade, Nelson, Washington, West Point Ind
Northern Kentucky	Beechwood Ind, Bellevue Ind, Boone, Campbell, Carroll, Covington Ind, Dayton Ind, Erlanger-Elsmere Ind, Fort Thomas Ind, Gallatin, Grant, Kenton, Ludlow Ind, Newport Ind, Owen, Pendleton, Silver Grove Ind, Southgate Ind, Walton-Verona Ind, Williamstown Ind
Pennyrile	Caldwell, Christian, Crittenden, Dawson Springs Ind, Hopkins, Livingston, Lyon, Muhlenberg, Todd, Trigg
Purchase	Ballard, Calloway, Carlisle, Fulton, Fulton Ind, Graves, Hickman, Marshall, Mayfield Ind, McCracken, Murray Ind, Paducah Ind

Source: Staff analysis of data from the Kentucky Association for Economic Development.

Appendix H

2010 Graduates'Degree-Earning Rates And Potential Additional FY 2016 Wages By FRPL

Table H.1
2010 Graduates' Degree-Earning Rates By ACT Composite And FRPL Eligibility

ACT Composite	Not FRPL			FRPL			Number Of FRPL Graduates Who Would Have Earned Degree At Non-FRPL Rates	Difference From Actual Number Of FRPL Graduates Who Earned Degree
	Number Of 2010 Graduates	Number Earning Degree By 2016	Percent Earning Degree	Number Of 2010 Graduates	Number Earning Degree By 2016	Percent Earning Degree		
14 or less	2,946	199	7	7,084	198	3	479	281
15 to 17	4,934	974	20	6,293	563	9	1,242	679
18 to 20	5,023	1,971	39	3,891	850	22	1,527	677
21 to 23	4,120	2,297	56	1,901	627	33	1,060	433
24 or above	5,230	3,751	72	1,287	628	49	923	295
Total								2,365

Note: FRPL = free or reduced-price lunch.
Source: Staff analysis of data from the Kentucky Department of Education and Kentucky Center for Education and Workforce Statistics.

Table H.2
Potential Additional Wages In FY 2016
If FRPL 2010 Graduates Had Earned Degrees
At The Same Rate As Similarly Achieving Non-FRPL 2010 Graduates

	Wage Premium For FRPL Graduates With Degrees*	Number Of Potential Additional Degrees**	Potential Additional Wages For Group
14 or less	$4,867	281	$1,367,627
15 to 17	4,164	679	2,827,356
18 to 20	6,143	677	4,158,811
21 to 23	7,448	433	3,224,984
24 or above	5,384	295	1,588,280
Total	N/A	2,365	$13,167,058

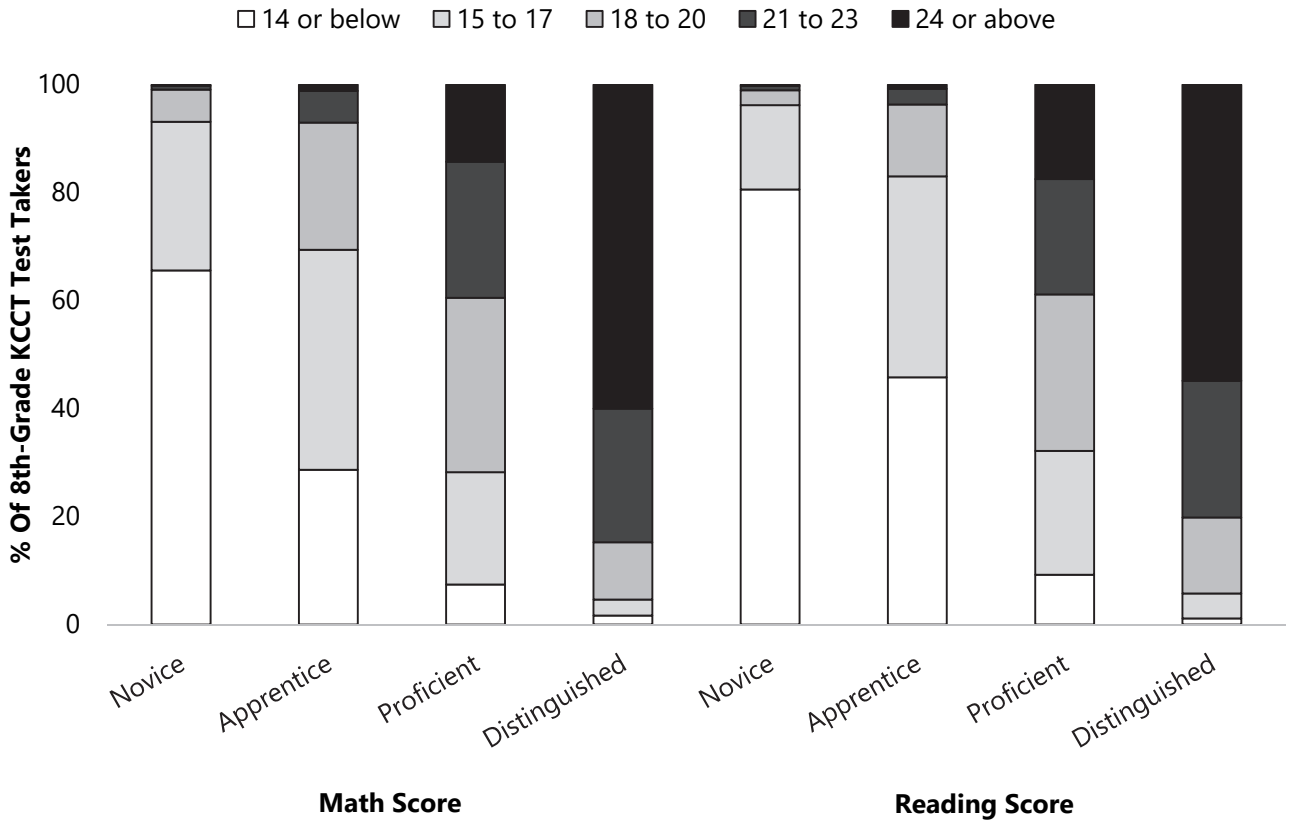
Note: FRPL = free or reduced-price lunch.
*As shown in Appendix D.
** Numbers taken from Table F.1.
Source: Staff analysis of data from the Kentucky Department of Education and Workforce Statistics.

Appendix I

Relationship Between 8th-Grade KCCT Scores And 11th-Grade ACT Scores, Class Of 2015

The figure below shows that the majority of 8th-graders from the class of 2015 who scored distinguished in reading and math on the 8th-grade Kentucky Core Content Test (KCCT) went on to earn ACT composite scores of 21 or above, making them likely to earn a college degree. However, less than half (40 percent) of students who scored proficient in reading and math went on to earn ACT composite scores of 21 or higher. Students who score proficient on state tests are not generally the target of efforts at academic acceleration, but these data suggest that proficient students may have to progress at an accelerated pace in high school if they are to meet academic standards that make them likely to earn a college degree.

Class Of 2015 11th-Grade ACT Composite Score
By 8th-Grade KCCT Reading And Math Performance Designations



Note: Percentages in the figure are calculated from the 41,241 class of 2015 students who took the Kentucky Core Content Test (KCCT) reading and math tests in the 8th grade and the ACT in the 11th grade.
Source: Staff analysis of data from the Kentucky Department of Education and Workforce Statistics.

Appendix J

FY 2016 Wages Of 2010 High School Graduates With No Postsecondary Degree Or Credential By Student Group

Student Category	Number	2016 Wages
All	19,729	$19,797
Female	8,482	15,870
Male	11,222	22,774
Black	2,825	15,990
Hispanic	324	21,395
White	16,116	20,492
IEP	1,581	16,783
FRPL	11,825	18,255
Non-FRPL	7,904	22,103

Note: Some figures do not sum due to missing data for some variables. CTE = career and technical education; IEP = individualized education program; FRPL = free or reduced-price lunch.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Appendix N looks at the association between student group and salary once additional factors—such as workforce sector, completion of a CTE sequence, behavior, and chronic absence status— are taken into account. The analysis shows that, while the general patterns described in the table above persist, the effects are smaller for some variables and larger for others. Gender persists as the characteristic that influences wages the most; being female is associated with a salary of almost $4,400 less. The table above shows that black graduates earn, on average more than $3,800 less than all students. Appendix N shows that, once other factors are taken into account, the influence on wages of being black decreases to $1,307. The table above shows that students receiving free or reduced-price lunch (FRPL) earn more than $1,500 less than the average for all students. However, as shown in Appendix N, when other factors are considered, FRPL status is associated with over $2,400 less in salary.

Appendix K

FY 2016 Average Wages Of 2010 Graduates With No Postsecondary Degree By High School Indicators

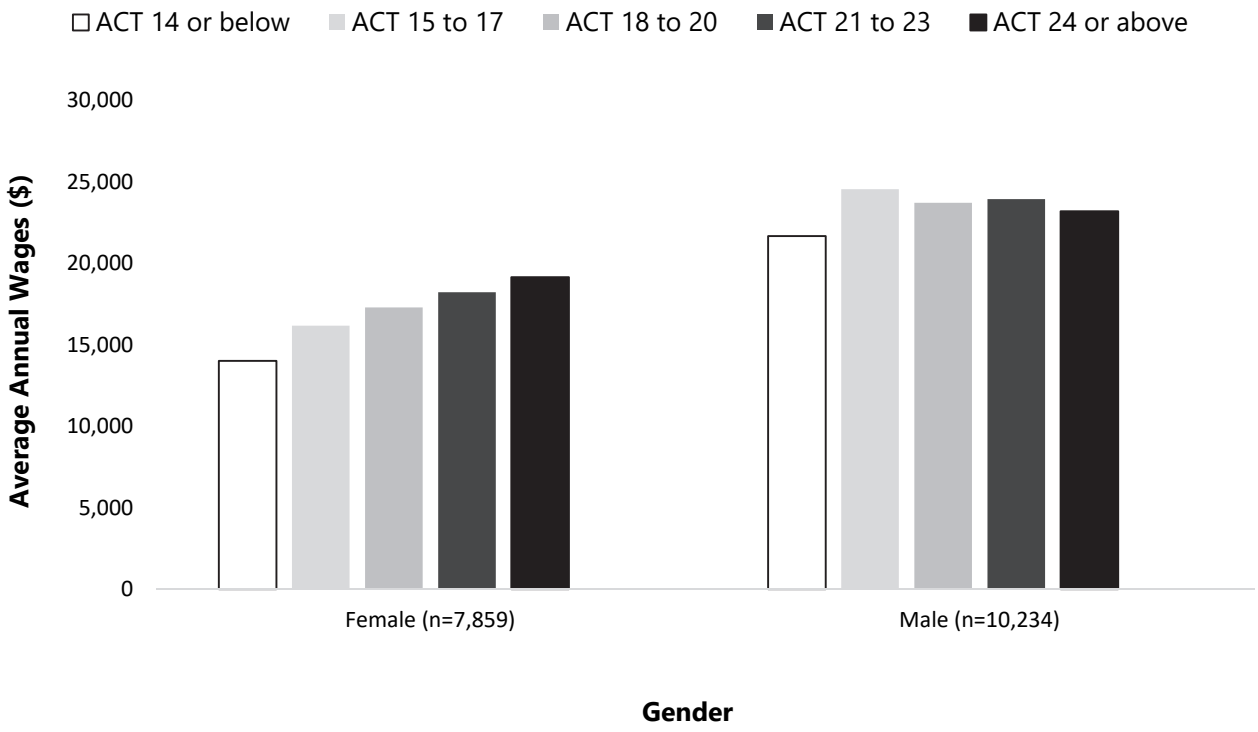
Table K.1
FY 2016 Wages Of 2010 Graduates
By ACT And Behavioral Indicators

ACT Composite Score	Number			Average Wages			
	All	Positive Indicators	Negative Indicators	All	Positive Indicators	Negative Indicators	Difference*
14 or below	6,005	1,199	3,172	18,726	21,326	16,937	4,389
15 to 17	5,967	1,426	2,845	20,677	23,484	18,490	4,994
18 to 20	3,458	947	1,461	20,595	22,553	18,815	3,737
21 to 23	1,616	505	625	21,463	23,703	19,750	3,953
24 or above	1,066	411	335	21,680	22,638	21,151	1,486

Note: Data include only high school graduates who were not enrolled in college and had not earned a postsecondary degree. Positive behavioral indicators are absence of 9 days or less and no board or law violations; negative behavioral indicators are chronic absence (18 days or more) or one or more board or law violations. About one-quarter of workers do not meet criteria for either positive or negative behavior. Some figures do not sum because of rounding.
*Difference between wages of graduates with positive versus negative indicators.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

As shown below, the relatively minor difference in wages by ACT score is influenced by the fact that the nondegreed class of 2010 workforce comprises more males (57 percent) than females (43 percent). There is almost no association between ACT scores and male wages, whereas female wages do increase moderately with ACT scores.

Figure K.A
FY 2016 Wages Of 2010 Graduates By 11th-Grade ACT Composite And Gender



Note: Data include only high school graduates who were not enrolled in college and had not earned a postsecondary degree.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Table K.2
FY 2016 Wages Of 2010 Graduates
By GPA And Behavioral Indicators

		Number			Wages			
GPA Range	%*	All	Pos.	Neg.	All	Pos.	Neg.	Difference**
0.00 to 1.99	24	4,529	610	2,731	17,686	21,029	16,526	4,502
2.00 to 2.49	27	5,130	938	2,723	19,422	22,261	17,759	4,502
2.50 to 2.99	25	4,822	1,297	2,052	20,972	22,977	18,879	4,097
3.00 to 3.49	18	3,371	1,203	1,173	21,716	22,701	19,855	2,847
3.50 and above	6	1,065	527	264	22,471	23,866	20,963	2,902

Note: Data include only high school graduates who were not enrolled in college and had not earned a postsecondary degree. Positive behavioral indicators are absence of less than 10 days and no board or law violations; negative behavioral indicators are chronic absence (18 days or more) or one or more board or law violations. GPA is from 12th grade or last available. Pos. = positive; Neg. = negative.
* Percent of graduates: Does not include 812 graduates for whom complete GPA data were not available.
** Difference between wages of graduates with positive versus negative indicators.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Table K.3
FY 2016 Wages Of 2010 Graduates
By CTE Completion And CTE

ACT Composite Score	Number Of Students	Percent Completed CTE Sequence	FY 2016 Wages		
			Completed CTE Sequence	Did Not Complete CTE Sequence	Difference
14 or less	6,005	34	$21,626	$17,214	$4,412
15 to 17	5,967	37	22,649	19,527	3,122
18 to 20	3,458	34	21,616	20,066	1,550
21 to 23	1,616	29	23,355	20,700	2,655
24 or above	1,066	21	23,587	21,161	2,427
Total	18,112	33	22,088	18,694	3,394

Note: Data include only high school graduates who were not enrolled in college and had not earned a postsecondary degree. CTE = career and technical education. Some figures do not sum because of rounding.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Appendix L

CTE Completion By Area Development District

Table L.1 shows the percentage of 2015 graduates, by region and ACT composite score, who completed career and technical education (CTE) preparatory sequences. The table shows substantial variation among districts. Big Sandy and Buffalo Trace had the highest percentage of graduate CTE completers, both in general and among the students scoring 14 or below. KIPDA, which includes Jefferson County, had the lowest rate of CTE completers. The percentage of Jefferson County CTE completers among students with ACT scores of 14 or less was 18 percent, compared to 30 percent in the state as a whole. See Table G.4 for a list of the districts included in each area development district.

Table L.1
Percent Of 2015 Graduates Completing CTE Preparatory Course Sequence
By Area Development District And ACT Composite Score

Area Development District	Number Of Students	% Completing CTE Sequence	ACT Composite Score				
			24 and above	21 to 23	18 to 20	15 to 17	14 or below
All	45,450	33	26	36	39	38	30
Barren River	3,299	37	29	42	44	43	36
Big Sandy	1,816	52	46	55	56	59	50
Bluegrass	7,799	32	24	38	38	37	28
Buffalo Trace	639	50	41	52	58	60	48
Cumberland Valley	2,598	33	28	32	39	39	32
FIVCO	1,540	42	29	44	50	51	41
Gateway	928	39	34	43	51	48	32
Green River	2,266	32	31	38	39	29	27
Kentucky River	1,246	48	40	50	54	50	46
KIPDA	9,241	21	16	23	25	26	18
Lake Cumberland	2,270	48	46	57	55	48	42
Lincoln Trail	3,264	35	31	39	41	38	31
Northern Kentucky	4,365	23	14	21	29	30	27
Pennyrile	2,146	39	40	47	47	38	31
Purchase	2,022	33	30	38	39	36	29

Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Appendix M

Wages Of High School Graduates With No Postsecondary Degree Or Credential By Workforce Sector And Gender

Table M.1
FY 2016 Wages And Proportional Employment Of 2010 Graduates With No Postsecondary Education Or Credential In Lower-Paying Sectors, By Gender

Industry Sector	Average Wages	Percent Of Female Workers Employed In Sector	Percent Of Male Workers Employed In Sector	Ratio Of Percent Of Women To Percent Of Men
Accommodation and food services	$12,211	19	12	1.6
Administrative and support, and waste management and remediation services	13,195	13	16	0.8
Health care and social assistance	17,243	19	3	6.3
Retail trade	15,990	18	14	1.3

Note: Data include only high school graduates who were not enrolled in college and had not earned a postsecondary degree.
Source: Staff analysis of data from the Kentucky Department of Education and Workforce Statistics.

Table M.2
FY 2016 Wages And Proportional Employment Of 2010 Graduates With No Postsecondary Education Or Credential In Higher-Paying Sectors, By Gender

Industry Sector	Average Wages	Percent Of Female Workers Employed In Sector	Percent Of Male Workers Employed In Sector	Ratio Of Percent Of Men To Percent Of Women
Construction	$27,497	0.4	8	20.0
Finance and insurance	24,142	5	1	0.2
Manufacturing	32,374	7	20	2.9
Transportation and warehousing	24,027	3	7	2.3

Note: Data include only high school graduates who were not enrolled in college and had not earned a postsecondary degree.
Source: Staff analysis of data from the Kentucky Department of Education and Workforce Statistics.

Appendix N

Statistical Modeling On Wages Of 2010 Graduates Who Have No Postsecondary Degree

Table N.1 displays the results of the regression used to isolate the effects of factors analyzed in Chapter 3 on wages of 2010 graduates. The variables have been sorted by overall effect on the control group mean wages.[a] For this model all variables were deemed statistically significant besides the "other race" category. The variable that had the largest positive impact on wages, according to the model, was the employment sector binary variable of construction, manufacturing, or mining. Those who worked in this sector were projected to earn nearly $13,000 more per year than the control group mean wages. The employment sector variable also accounted for the largest portion of the explained variance attributed to the model. According to the modeling, males within this population fare much better than females in terms of wages earned. Members of this population who were classified as Hispanic were projected to earn approximately $2,400 more per year than the white members of this population.

The chronic absence status variables, the law violation variable, members of the population who are black, and those who scored 14 or less on the ACT composite were all projected to earn at least $1,300 less than the control group mean. The variable with the largest negative impact on wages for this group was individualized education program (IEP) status; those who had an IEP were projected to earn $2,830 less than the control group mean.

[a]The control for this model is a white female who was not chronically absent during 11th or 12th grade; scored higher than 14 on the ACT composite; had a 12th-grade final GPA below 3.0; had zero board or law violations; and did not work in construction, manufacturing, or mining employment sectors.

Table N.1
Ordinary Least Squares Regression Output
On 2016 Wages Of 2010 Graduates With No Postsecondary Degree

Dependent Variable = 2016 Wages				
Explanatory Variables	**Beta Coefficient**	**Standard Error**	**t-value**	**% Explained Variance**
Construction, manufacturing, and mining	$12,807	256	49.99	11.21%
Male	4,381	211	20.74	5.41
Hispanic	2,877	776	3.71	0.03
Completed CTE sequence	1,938	210	9.24	0.37
Final 12th-grade GPA 3.0 or greater	1,491	231	6.45	0.19
Board violation	-169	29	-5.88	0.16
Black	-1,307	301	-4.35	0.52
Chronically absent 11th grade	-1,310	240	-5.45	1.55
Chronically absent 12th grade	-1,353	230	-5.87	0.42
ACT composite 14 or less	-1,403	225	-6.24	0.09
Law violation	-2,086	385	-5.41	0.18
FRPL ever	-2,425	208	-11.67	0.63
IEP ever	-2,830	373	-7.58	0.25
Other race*	—	—	—	—
Comparison group mean wages	$17,521			
R-squared				21.01%

Note: Beta coefficients have been rounded to the nearest dollar amount, and standard error terms have been rounded to the nearest whole number.
*The category of "other race," which includes all students in the population who were not white, Hispanic, or black, was not statistically significant according to the ordinary least squares regression output.
Note: Beta coefficients have been rounded to the nearest dollar amount, and standard error terms have been rounded to the nearest whole number.
Source: Staff analysis conducted on data provided by the Kentucky Department of Education and the Kentucky Center for Education and Workforce Statistics.

Model Description

This analysis was conducted on a subset of the Cohort 1 population that as of 2016 had neither earned a postsecondary degree nor enrolled in a postsecondary institution. The goal of this analysis is to determine whether high school attendance and disciplinary actions are predictive factors for future wage attainment for this particular population. An ordinary least squares regression model was used to gain further insight regarding the potential effects of high school performance, demographics, and employment sector choice on the wages of the selected population.

Dependent And Explanatory Variables. A stepwise modeling process was used to determine the percentage of variance explained (R-squared in Table N.1) by the various categories of explanatory variables used, with the dependent variable being the 2016 wages of the population. The explanatory variables of note were the high school indicators concerning law and board violations (βDiscipline), chronic absence status during the 11th- and 12th-grade years (βCA), 12th-grade final GPA and ACT scores (βGPA and βACT), whether the student completed a career and technical education training cluster (βCTE), and free and reduced-price lunch status

and individualized education program status (βGAP).[b] The model also controls for employment sector (βSECTOR) by separating the population into two categories: those who work in construction, manufacturing, or mining fields and those who do not. The model also uses demographic controls for race and gender (βDEMO).[c] The equations for the models include the intercept (α) and residual error terms (ε).

$$\textbf{\textit{Model 1: Wages} = \alpha + \beta\textit{Discipline} + \varepsilon}$$
$$\textbf{\textit{Model 2: Wages} = \alpha + \beta\textit{Discipline} + \beta\textit{CA} + \varepsilon}$$
$$\textbf{\textit{Model 3: Wages} = \alpha + \beta\textit{Discipline} + \beta\textit{CA} + \beta\textit{ACT} + \varepsilon}$$
$$\textbf{\textit{Model 4: Wages} = \alpha + \beta\textit{Discipline} + \beta\textit{CA} + \beta\textit{ACT} + \beta\textit{DEMO} + \varepsilon}$$
$$\textbf{\textit{Model 5: Wages} = \alpha + \beta\textit{Discipline} + \beta\textit{CA} + \beta\textit{ACT} + \beta\textit{DEMO} + \beta\textit{SECTOR} + \varepsilon}$$
$$\textbf{\textit{Model 6: Wages} = \alpha + \beta\textit{Discipline} + \beta\textit{CA} + \beta\textit{ACT} + \beta\textit{DEMO} + \beta\textit{SECTOR} + \beta\textit{GPA} + \varepsilon}$$
$$\textbf{\textit{Model 7: Wages} = \alpha + \beta\textit{Discipline} + \beta\textit{CA} + \beta\textit{ACT} + \beta\textit{DEMO} + \beta\textit{SECTOR} + \beta\textit{GPA} + \beta\textit{GAP} + \varepsilon}$$
$$\textbf{\textit{Model 8: Wages} = \alpha + \beta\textit{Discipline} + \beta\textit{CA} + \beta\textit{ACT} + \beta\textit{DEMO} + \beta\textit{SECTOR} + \beta\textit{GPA} + \beta\textit{GAP} + \beta\textit{CTE} + \varepsilon}$$

[b]Chronic absence status for this section is defined as missing 18 or more days for any reason. ACT scores in the regression model were coded for those students who scored 14 or less on the ACT composite and for those who scored above 14 on the ACT composite during their junior year.

[c] All races other than white, Hispanic, and black were coded in the model as "other race."

Appendix O

FY 2016 Wages Of 2015 High School Graduates With No Postsecondary Education By Workforce Sector

Sector	Number Employed In Sector	Percent Employed In Sector	Percent Employed In Sector Who Completed Pathway	Wages			
				All	CTE Preparatory Completers	CTE Noncompleters	Difference
Accommodation, food services	3,785	24.2	25	$6,936	$7,414	$6,773	$641
Administrative and support, waste management and remediation services	2,864	18.3	28	8,620	9,936	8,120	1,816
Agriculture, forestry, fishing, hunting	45	0.3	47	13,680	14,252	13,179	1,073
Arts, entertainment, recreation	271	1.7	23	3,864	5,352	3,423	1,930
Construction	598	3.8	46	16,360	17,747	15,188	2,560
Educational services	108	0.7	31	7,300	6,874	7,488	-614
Finance and insurance	101	0.6	29	13,521	16,416	12,355	4,060
Health care, social assistance	937	6.0	39	9,828	10,859	9,164	1,696
Information	133	0.8	20	8,611	8,705	8,586	119
Management of companies and enterprises	36	0.2	19	8,405	9,205	8,211	994
Manufacturing	1,377	8.8	43	17,053	19,032	15,555	3,477
Mining, quarrying, oil and gas extraction	15	0.1	33	20,546	23,222	19,208	4,014
Services other than public administration)	322	2.1	29	8,980	10,905	8,211	2,694
Professional, scientific, technical services	249	1.6	35	8,542	10,512	7,502	3,010
Public administration	127	0.8	37	9,258	10,686	8,419	2,267
Real estate, rental, leasing	73	0.5	34	10,912	11,184	10,771	413
Retail trade	3,335	21.3	29	7,716	8,051	7,579	473
Transportation, warehousing	745	4.8	28	11,392	11,978	11,163	815
Utilities	26	0.2	65	15,747	15,625	15,978	-354
Wholesale trade	294	1.9	45	14,141	14,939	13,490	1,449

Note: Some figures do not sum because of rounding.
Source: Staff analysis of data from the Kentucky Center for Education and Workforce Statistics.

Endnotes

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