Career And Technical Education Enrollment And Subsequent Employment By Sector

Research Report No. 464

Office Of Education Accountability

Kentucky Legislative Research Commission

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Career And Technical Education Enrollment And Subsequent Employment By Sector

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Foreword

In November 2018, the Education Assessment and Accountability Review Subcommittee approved a research agenda for the Office of Education Accountability that included a study of Career And Technical Education Enrollment And Subsequent Employment By Sector.

The goal of career and technical education (CTE) is to prepare students to be successful in taking the next steps in their adult lives whether that be attending college or entering the workforce. This publication tracks Kentucky high school graduates from the graduating classes of 2013, 2015, and 2017 who have completed CTE pathways in specific program areas into postsecondary education and the workforce. It looks for relationships between CTE pathway completion, attainment of industry certification in high school, continuing postsecondary education, and wages in different workforce sectors.

Staff would like to thank personnel at the Kentucky Center for Statistics for their assistance and the superintendents and school principals who responded to the survey for this study.

Jay D. Hartz
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Background

Career and technical education (CTE) links the teaching of academic content with the skills and abilities that will be required of graduates when they enter the workforce. In recent years, state and national policy makers have focused on increasing alignment of high school CTE with workforce demand in a quickly changing economy. Educators now have unprecedented access to labor market data that allows for identification of specific occupations that will be in demand, along with the skills and education levels required for those occupations. They are working with industry leaders to promote CTE pathways that are aligned with these in-demand occupations.[a]

This report uses data from the Kentucky Center for Statistics to follow high school graduates from the graduating classes of 2013, 2015, and 2017 who have completed CTE pathways in specific program areas into postsecondary education and the workforce. It looks for relationships between CTE pathway completion and attainment of industry certification in high school, continuing postsecondary education, and wages in different workforce sectors.

The report focuses largely on those CTE program areas that are aligned with workforce sectors that the Kentucky Workforce Innovation Board has identified as high wage and high demand (HWHD):

- Business and information technology
- Health care
- Construction
- Advanced manufacturing
- Transportation and logistics

It reports outcomes for CTE pathway completers in these HWHD program areas as well as outcomes for graduates completing pathways that have not been identified as HWHD but are common in Kentucky high schools, including agriculture, law/public safety, and human services. The report shows wages for CTE pathway completers at various levels of continuing postsecondary education but focuses largely on graduates who have entered the workforce with no postsecondary education. Two-thirds of the new jobs projected for Kentucky between 2018 and 2022 do not require postsecondary education and, historically, most high school graduates in the commonwealth have entered the job market without a postsecondary degree or credential.

Major Findings

The report shows clear and continuing wage premiums for CTE pathway completers versus noncompleters in almost every job sector, along with higher rates of labor market participation.

[a] Career pathways are coherent sequences of at least four academic and technical courses relevant to a job sector; they form the basis of the CTE instructional experience for students. Courses within individual pathways are designed to lead to industry certification or preparation for ongoing education.

These wage premiums are greatest in the years immediately following graduation and for graduates who do not earn a postsecondary degree or credential. CTE wage premiums persist for many years following graduation, however, and are present at every level of postsecondary education.

The report shows higher wages for CTE pathway completers with skills that prepare them for work in the manufacturing, construction, and transportation sectors. Of these workforce sectors, the highest wages are in the manufacturing sector. The supply of workers in the higher-wage sectors has not yet met demand. For example, while over 8 percent of the jobs projected for 2018 to 2022 are in the manufacturing sector, less than 3 percent of graduates complete manufacturing pathways.

CTE completion in manufacturing, construction, and transportation is uneven across the state, depending on

- geographic region;
- whether students receive CTE in comprehensive high schools, state-operated area technology centers (ATCs) or local area vocational education centers (LAVECs); and
- student gender or race.

In 2018, for example, more than one-third of districts in the commonwealth—including Jefferson and Fayette Counties—had few or no graduates (less than 1 percent) completing manufacturing pathways. ATC students are much more likely than LAVEC students to complete pathways in manufacturing, construction, and transportation. Few comprehensive high schools offer these programs.

CTE completers in the remaining HWHD program areas earn less than those in manufacturing, construction, and transportation and often less than those in pathways that are not considered HWHD, especially agriculture. Given that health pathways have seen the largest increase in recent years and had the greatest enrollment in 2019, it is notable that most health pathway completers do not earn a college degree and those working without a college degree earn less, on average, than CTE noncompleters. Whereas graduates in manufacturing, construction, and transportation earn relatively high wages even without any additional postsecondary education, health program pathway completers generally earn higher wages only after earning an associate's degree or above. For the relatively higher investment in health versus other CTE program areas to yield benefits for graduates and for the health industry, many more health program completers must earn postsecondary degrees of associate or above. Current limits in the number of postsecondary health enrollment slots available may be one factor that limits this potential.

Given the relatively low projections for jobs in the agriculture sectors and the relatively high numbers of graduates completing CTE agriculture programs, it may seem surprising that CTE agriculture pathway completers earn wages that are comparable to or greater than those in HWHD program areas. The data suggest that skills and abilities learned in agriculture pathways may be transferable to many of the higher-wage sectors. Principals and superintendents interviewed or surveyed for this study expressed discontent about the relatively low funding for or emphasis placed on agriculture and some other CTE programs for which they saw local need.

The report shows much smaller CTE wage premiums for female students than for male students, for federal free or reduced-price lunch program-eligible students than for ineligible students, and for black students than for white students.

CTE performance-based assessments—industry certificates or Kentucky Occupational Skill Standards and Assessment exams—are also associated with higher wages, especially for pathway completers. Data from 2017 graduates indicate lower wage premiums for graduates who pass performance-based assessments but do not complete CTE pathways. The commonwealth's previous accountability system for districts and schools incentivized schools to ensure that students completed at least two courses within a CTE pathway, but the state's current accountability system does not.

Considerations For CTE Policies And Programs

The report provides the following general areas for consideration in the crafting of CTE policies or programs.

Expanding Access To Higher-Wage Pathways Among Kentucky Districts And Student Groups

Graduates completing CTE programs in the higher-wage program areas are more likely to work in higher-wage sectors and, on average, earn more than other graduates in those sectors. Access to higher-wage CTE programs is low for many students participating in CTE in comprehensive high schools or LAVECs. The relatively higher concentration of manufacturing, construction, and transportation pathways in ATCs versus LAVECs and comprehensive high schools likely reflects differences in the way CTE is funded in these settings. ATCs receive approximately five times as much state funding per pupil each year as do LAVECs. Costs are generally much higher for starting up a pathway in manufacturing, construction, or transportation than for doing so in business or health sciences. In addition, female and black students complete these higher-wage pathways at lower rates than do male and white students.

Local Decision Making

OEA site visit and survey data indicate frustration of local leaders with limitations put on pathways that can be offered based on what is considered HWHD at the state level. Data in the report show that wages in some of the pathways that are not considered HWHD—agriculture pathways, most specifically—can often surpass those in the health and business program areas.[b]

Data in this report also raise the concern that CTE opportunities offered to high school students may not always be in line with workforce demand and greatest opportunities for high school graduates.

[b] The Agricultural Power, Structural, Technical Systems pathway is currently labeled HWHD for purposes of additional points in the accountability system, but other agriculture pathways are not and may not be approved for ATCs.

Use Of Outcome Data To Evaluate Programs

This report provides strong evidence of likely positive effects of the state's recent efforts to expand access to pathways in manufacturing, construction, and transportation. It also illustrates that workforce outcomes for CTE graduates in other pathways may not always reflect desired outcomes. The General Assembly may wish to periodically review data on the relationship between CTE pathways offered and workforce outcomes.

In addition, the General Assembly may wish to request studies that track the postsecondary outcomes of graduates who are being considered transition ready in the current accountability system. Some districts, in response to the current policy incentives, might elect to reduce the number of courses offered in individual pathways in favor of increasing the number of classes that might lead to industry certificates in different program areas. It is unknown whether graduates who earn industry certificates or pass state-approved exams without completing pathways can expect the same wage benefits.

Chapter 1

Introduction And Overview

Career and technical education (CTE) links academic content with instruction relevant to the content knowledge and skills needed for jobs in specific occupations and industry sectors. Its goal is to prepare students to be successful in taking the next step in their adult lives, whether that be attending college or entering the workforce.

Policymakers are focusing on strengthening the link between career and technical education (CTE) in high school and the skills needed by employers in specific industry sectors.

Nationwide, employers' concerns about a "skills gap" between the types of workers needed by industry and those available in the workforce have focused greater attention on the content of CTE programs. State and national policies are promoting greater alignment between industry demand and CTE programs by using labor market information to inform curriculum decisions and to promote CTE programs in industry sectors that are projected to be high wage and high demand (HWHD).

The Kentucky Workforce Innovation Board has identified five high-wage high-demand (HWHD) sectors.

The Kentucky Workforce Innovation Board (KWIB) has identified five HWHD sectors in Kentucky:

- Business and information technology (IT)
- Health care
- Construction
- Advanced manufacturing
- Transportation and logistics [a] [b]

State and national policies are also focusing on easing the transition between high school CTE programs and postsecondary learning opportunities that lead to additional credentials and higher wages. In Kentucky, these policies include scholarships for high school students to earn college credits while in high school and to later gain credentials or degrees in HWHD areas in the Kentucky Community and Technical College System (KCTCS).

[a] The 27-member Kentucky Workforce Innovation Board serves as an advisory board to the governor on workforce training and development issues. KWIB is charged with creating a statewide vision for workforce development and adopting a plan to move Kentucky forward through workforce training and development.

[b] The Kentucky Department of Education has worked with KWIB to identify some additional HWHD pathways for Kentucky's accountability system. These include some education and agriculture pathways.

The highest-wage jobs of the future will require at least some postsecondary education. It is critical, therefore, to strengthen the link between CTE in high school and postsecondary institutions. At the same time, it is important to understand the relationship between CTE at the high school level and workforce outcomes for those who do not go on to earn postsecondary degrees. Almost two-thirds of the jobs projected for Kentucky between 2018 and 2022 do not require any education past high school.[c] [1] Further, given Kentucky's historic college completion rates, it is likely that Kentucky's workforce will continue to rely heavily on workers with no postsecondary degrees.

This report tracks high school graduates from the graduating classes of 2013, 2015, and 2017 to look for relationships between completion of specific CTE pathways and postsecondary outcomes.

This report looks at high school graduates from the graduating classes of 2013, 2015, and 2017 who have completed CTE pathways in specific program areas, and it tracks them into postsecondary education and the workforce. It looks for relationships between CTE pathway completion, attainment of industry certification in high school, continuing postsecondary education, and wages in different workforce sectors.

Description Of This Study

In November 2018, the Education Assessment and Accountability Review Subcommittee requested that the Office of Education Accountability (OEA) study career and technical education enrollment and subsequent employment by industry sector. It requested that OEA report on the CTE opportunities available to students relative to indicators of workplace demand. It also requested that OEA analyze the relationships among CTE pathways completed, credentials earned by high school students, and sector-specific employment and wages. The committee requested, further, that the data be disaggregated by district, region, and student demographic characteristics.

Major Conclusions

- In 2018, 15,598 graduates (33 percent) completed at least one CTE pathway. Graduates' rates of CTE pathway completion varied substantially among districts. Districts with the highest percentages tend to be small or rural, whereas CTE completion rates in the state's largest, more urban districts are lower. Pathway completion rates are slightly higher for male

[c] Education levels required for projected jobs is based on staff analysis of the Kentucky Future Skills Report, which identifies the education level required in each occupation group, along with total jobs in that group.

graduates than for female graduates and much higher for white graduates than for black graduates.

- CTE program completers earn college degrees at the same rate (27 percent) as graduates who do not complete CTE programs but are more likely to earn associate's degrees and postsecondary certificates than bachelor's degrees.

- CTE program completion yields salary premiums for workers at all levels of education, but premiums are greatest for those with no postsecondary education. On average, 2013 graduates with no postsecondary education who were CTE pathway completers earned 22 percent more in 2018—5 years after high school graduation—than their peers who did not complete CTE pathways.

- CTE performance-based assessments are also associated with higher wages. Pathway completers who enter the workforce without a postsecondary degree earn substantially higher wages if they have also earned an industry certificate or passed a Kentucky Occupational Skill Standards Assessment (KOSSA) exam. In 2018, 70 percent of completers earned one of these additional credentials.

- Graduates who completed manufacturing pathways earn, on average, much higher wages than those from any other program area, followed by graduates from construction and transportation pathways. A 2013 manufacturing pathway completer working in 2018 without a postsecondary degree earned about 150 percent as much as a graduate who did not complete a CTE pathway. Relative to demand, enrollment in manufacturing and transportation pathways is low. While over 8 percent of new jobs are projected to be in manufacturing, only 2.8 percent of graduates in 2018 completed a manufacturing pathway. While 4.6 percent of occupations are in auto or other repair and installation, only 1.7 percent of graduates completed transportation pathways.

- Of the HWHD pathway completers without a postsecondary degree or credential, those completing health pathways earned the lowest salaries and often less than those who did not complete a pathway at all.[d] As of 2018, less than one-quarter of

[d] While this finding reflects, in part, the fact that female graduates generally earn less than males and health completers are predominantly female, males who complete health pathways also earn less than their peers in manufacturing, construction, and transportation pathways.

2013 health pathway completers had earned an associate's degree or above.[e] In order to realize the full wage benefit of working in the health industry, workers need to complete at least an associate's degree.

- In 2018, pathway completions in HWHD CTE program areas were greatest in health sciences, followed by business. The growth in the total number of health science pathway completers between 2012 and 2018 is 3 times as great as in any other HWHD program area. By 2018, the number of graduates completing pathways in health sciences was 2 to 4 times as great as the numbers completing pathways in each of the program areas associated with highest wages—manufacturing, construction, and transportation.

- Of the pathways that have not been identified as HWHD, agriculture had the greatest number of completers in 2018, accounting for almost as many completers as health sciences. The percentage of graduates completing agriculture pathways far exceeds the projected demand for agriculture jobs in the state; however, graduates from agriculture pathways earn higher wages across many work sectors than those from other pathways.[f] One possible explanation is that some of the skills acquired in agriculture pathways are transferable to other workforce sectors.

- Access to manufacturing, construction, and transportation programs is uneven in districts across the state and is concentrated in districts whose students attend ATCs. Few comprehensive high schools offer manufacturing, construction, or transportation programs. Compared with local area vocational educational centers (LAVECs), area technology centers (ATCs) are much more likely to graduate students who have completed pathways in manufacturing (2½ times as likely), construction (3 times as likely), and transportation (3 times as likely). Pathways in these programs cost more to operate than those in other program areas; principals report the

[e] Recent graduates in health pathways appear more academically prepared for college than the average CTE student, and historical data indicate that they have earned postsecondary degrees at rates higher than that for the average CTE student. However, they are not yet earning degrees at rates that will lead the majority to higher wages.

[f] The 2013 agriculture pathway completers who were working in the manufacturing sector in 2018 earned as much as manufacturing pathway completers working in that sector, and more than those from any other program.

cost of equipment and supplies and the availability of qualified teachers as barriers to opening new programs.

- CTE wage premiums are lower for female than for male pathway completers, lower for those eligible for the federal free or reduced-price lunch program (FRPL) than for ineligible completers, and lower for black than for white completers.[g]

- A relatively small percentage of pathway completers have access to work-based learning opportunities such as cooperative education credits, apprenticeships, internships, or job shadowing. These opportunities are more commonly available in health science, business, agriculture, and family and consumer science pathways than in other pathways.

- Compared to their peers who do not complete CTE pathways, graduates who complete CTE pathways are more likely to earn
  - a grade of C or above in at least one dual-credit class in high school,
  - a cooperative work credit, and
  - an industry certificate or a passing score on a KOSSA exam.

Preliminary data indicate positive outcomes associated with all of these additional indicators. Graduates who complete dual-credit classes enroll in college at higher rates than those who do not. Graduates who complete a cooperative work credit, earn an industry certificate, or pass a KOSSA exam earn, on average, higher wages than those who do not.

Data Used For This Report

Data in this report were provided primarily by the Kentucky Center for Statistics.

Data in this report were provided primarily by the Kentucky Center for Statistics (KYSTATS), which links high school data from the Kentucky Department of Education (KDE) with data from the Kentucky Council on Postsecondary Education (CPE) and with unemployment insurance (UI) wage data from the Kentucky Education and Workforce Development Cabinet. KDE data include student demographic and academic data, CTE pathway data, dual-credit data, and industry certificate/KOSSA data from the graduating classes of 2013, 2015, 2017, and 2018. CPE data include enrollment and specific degrees earned in all Kentucky postsecondary institutions.

[g] Wage premiums vary depending on the year examined and generally decrease somewhat for both males and females in the years that follow graduation. Male CTE premiums remained robust, however, in all years examined.

To make regional comparisons, OEA reports supply and demand by the local workforce areas (LWAs) that KYSTATS uses in reporting demand data. Appendix A shows districts in each of the state's 10 LWAs.

Staff also administered a survey to principals in all high schools that provide CTE, as well as conducting site visits in four districts.

In addition, staff conducted site visits to four districts, interviewing superintendents, and principals of ATCs, LAVECs, and comprehensive high schools. The districts included one that housed an ATC, one ATC feeder district, and two districts that housed former ATCs that had been converted to LAVECs.

Finally, OEA administered a survey to principals in all of the state's ATCs, LAVECs, and comprehensive high schools.[h] Questions focused on factors that influence decisions to offer specific career pathways, barriers to offering career pathways, and work-based learning opportunities available to students in the program areas. Survey response rates were 75 percent for ATCs, 61 percent for LAVECs, and 73 percent for comprehensive high schools.

This report refers to school years by the year in which the school year ends. For example, the 2018-2019 school year is called the 2019 school year.

Limitations

Workforce data do not indicate specific occupations within a workforce sector and do not distinguish full- and part-time workers.

Wage data are recorded by industry sectors and do not include specific occupation codes. It is not possible, for example, to determine whether an individual recorded as working in the health sector at a hospital is working as a surgeon or as a cook. This limits the degree to which close connections can be established between specific CTE pathways and occupations. In addition, UI data does not indicate full- or part-time status. For that reason, the extent to which demographically associated wage differences are explained by hours worked is unclear.

Tracking relationships between business and transportation pathways and workforce participation is especially challenging, as jobs that require business marketing, management, or accounting skills can be found across workforce sectors. Transportation jobs also are difficult to track because many of the jobs that require auto mechanic or repair skills from CTE transportation pathways are found across workforce sectors.

[h] Surveys were also sent to principals in district-operated CTE centers that do not receive LAVEC funding.

The report focuses on wage data as an indication of success in specific career pathways. It does not mean to suggest that CTE pathways leading to jobs in lower-wage sectors are not valuable.

This report focuses primarily on wage data as an indication of success. It does not suggest, however, that pathways in which graduates earn lower wages are not valuable. Given that graduates will enter a labor market in which the majority of current job openings are in relatively low-wage industries, it is not realistic to expect that all CTE pathways will lead to high wages. Educators interviewed for this study and responding to the survey cited additional CTE-associated benefits such as engaging students, increasing the likelihood that they will graduate, and increasing the likelihood that they will participate in the job market and be productive members of their communities. Appendix B includes some survey respondents' comments on the broader benefits of CTE. While rigorous research on these benefits is lacking, research has shown that CTE can increase the likelihood of high school graduation.[2]

Organization Of The Report

Chapter 1 describes CTE governance and delivery in the commonwealth.

The remainder of Chapter 1 provides context for the delivery of CTE in Kentucky high schools, including CTE governance, reporting of CTE indicators in Kentucky's accountability system for districts and schools, efforts under way in the commonwealth to expand the reach of CTE, and state-level background data on workforce demand and CTE pathway completion generally.

Chapter 2 compares CTE enrollment with workforce demand. It also shows differences among CTE school types in pathways completed.

Chapter 2 reports enrollment trends in specific CTE program areas and compares current CTE enrollments with workforce demand. The chapter also reports patterns of CTE pathway completion among different school types, LWAs, and student demographic characteristics. Finally, the chapter reports on percentages of CTE pathway completers also passing dual-credit classes, earning industry certificates or passing KOSSA exams, and participating in work-based learning.

Chapter 3 tracks high school graduates into the workforce and postsecondary education and describes differences in wages and postsecondary attainment among pathways in different program areas.

Chapter 3 tracks high school graduates into the workforce and postsecondary education and describes differences in wages and postsecondary attainment among pathways in different program areas. The chapter also shows that the relationship between high school CTE pathway completion and postsecondary education reflects gender- and race-based differences in labor market outcomes generally.

High School CTE Outcome Indicators

Pathways

Career pathways are coherent sequences of at least four courses relevant to a job sector. They are designed to lead to industry certification and ongoing education.

This study uses career pathway completion as its primary indicator of CTE attainment. Career pathways are coherent sequences of at least four academic and technical courses relevant to a job sector; they form the basis of the CTE instructional experience for students. Courses within individual pathways are designed to lead to industry certification or preparation for ongoing education. Examples of pathways completed by Kentucky students in 2018 include industrial maintenance/electrical engineering, horticulture and plant science systems, prenursing, and electrician assistant. Schools and districts can only offer pathways described in KDE's CTE program of studies. In order to add a new pathway, a school or district must seek approval from KDE.

This report groups the over 170 individual career pathways into 12 major program areas.

In 2018, KDE reported 171 pathways in which students were enrolled in at least one location.[3] Those pathways are grouped into 12 major program areas based on groups established by the federal government in connection with the federal Strengthening Career and Technical Education for the 21st Century Act. Commonly known as Perkins V, this act shapes much of CTE policy at the national level, including the requirement that CTE be based on career pathway systems.[i] The Perkins program areas used in the report are

- agriculture and natural resources (frequently shortened to agriculture in this report);
- architecture and construction (construction);
- arts, A/V technology, and communications (arts/AV);
- business and administration (business);
- health science (health);
- human services;
- information technology (IT);
- law and public safety (law/safety);
- manufacturing;
- retail/wholesale sales and service (retail);
- science, technology, engineering, and mathematics (STEM); and
- transportation, distribution, and logistics (transportation).

[i] The Strengthening Career and Technical Education for the 21st Century Act was signed into law in 2018 and is the successor to the Carl D. Perkins Vocational and Technical Education Act of 2006 (Perkins IV).

Human Services Pathway. The human services program area comprises a variety of pathways, including those related to food (such as food science) and education (such as early childhood education). Human services comprises pathway areas that are sometimes reported separately: family and consumer sciences, and educational services. On occasion, and as noted, this report separates the human services program area into food and education pathways.

Students who complete four credits in a specific pathway are considered completers.

Completion. Students who complete four credits in a specific pathway are completers. Students begin to be counted for Perkins accountability and funding purposes only if they are considered concentrators, meaning they complete at least two credits in a pathway sequence.

Performance-Based Assessments

Career pathways are designed to prepare students to earn employer-recognized industry certificates.

Industry Certifications. Career pathways are designed to prepare students to earn certificates that are developed by industry groups and recognized as valuable by employers. As required by KRS 158.6455, industry certificates are considered appropriate as postsecondary readiness indicators only if KDE has recommended them in consultation with local workforce investment boards and industry groups.

Some career pathways culminate in state-developed end-of-program assessments.

State-Developed End-Of-Program Assessments. Assessments for career pathways that do not have an associated industry certificate are developed by KDE together with Kentucky postsecondary institutions and industry groups. These state-developed assessments were formerly known as the Kentucky Occupational Skills Standards and Assessment system and are referred to as such in this report.

Dual-Credit Courses

Dual-credit courses allow CTE students to earn credit toward high school graduation and a postsecondary degree.

Kentucky students are encouraged to take college-level courses while still in high school and earn credit toward both high school graduation and a postsecondary degree. Dual-credit courses for CTE students are offered primarily in KCTCS institutions and are aligned with course requirements for postsecondary credentials or degrees in the related pathway.

Work-Based Learning

Opportunities for work-based learning include mentorships, cooperative education experiences, internships, and apprenticeships.

Opportunities for work-based learning are considered important components of CTE education. These include mentorships, cooperative education experiences that allow students to earn work experience (co-ops), internships, and apprenticeships.

Kentucky's Revised Accountability System

Kentucky's accountability system provides several ways in which CTE students can be recognized as "transition ready."

Kentucky's revised accountability system, which is effective for the 2020 school year, offers multiple ways for CTE students to be counted as ready for adult life under the "transition ready" indicator of the new system. Kentucky students will be considered transition ready if they

- score at or above benchmark on an industry certificate or end-of-program assessment for articulated credit;
- complete 6 hours (two classes) of dual credit with a C or higher;
- complete a KDE- or Education and Workforce Development Cabinet-approved apprenticeship; or
- meet conditions to verify exceptional work experience.

Further, through a collaboration of KWIB and KDE, those industry certificates that are identified as HWHD receive a weight of 1.25 in the accountability system.

CTE course completion is no longer an element of Kentucky's accountability system.

While completion of a minimum of two courses within a CTE pathway was required to be considered career ready in the state's previous accountability system, course completion within pathways is not required in the current system.

CTE School Types And Governance

School Types

CTE courses are most commonly provided to Kentucky students in comprehensive high schools and in two types of career and technical schools: state-operated area technology centers (ATCs) or local area vocational education centers (LAVECs).

CTE courses are available to students in most Kentucky comprehensive high schools and in two types of career and technical schools: state-operated area technology centers or local area vocational education centers. Statewide, there are 53 ATCs that serve a total of 124 districts, 42 LAVECs serving a total of 34 districts, and an additional 8 locally funded CTE centers that are similar to LAVECs but receive no state funding.[j] Students in many districts take college-level classes that earn them dual credit in

[j] Jefferson and Fayette Counties each operate multiple LAVECs.

high school and college credit in KCTCS. In several districts, these classes are the only CTE options outside of the comprehensive high schools. Appendix C contains a complete accounting by district of CTE delivery options.

Governance

Area Technology Centers. As required by 780 KAR 2:030, each ATC has a steering committee through which ATC principals receive guidance from members who include

- the principal of the technology center, who serves as chair;
- the superintendent or designee of each cooperating school district;
- one board member from each cooperating school district;
- one principal from each cooperating school district;
- one representative from each site-based council;
- one or more representatives of the local labor market area; and
- one guidance counselor from each cooperating school district.

ATCs also have program committees composed of industry representatives, to advise the ATC on issues related to particular programs.

ATCs are housed in Kentucky districts, but management decisions are ultimately made by KDE.

Although ATCs are housed in Kentucky districts, management decisions about personnel, pathways, and all matters related to the governance of ATCs are made ultimately by KDE. ATCs must await KDE approval, for example, to offer a new pathway.

Management decisions in LAVECs are made by building principals with oversight from districts and local school boards. LAVECs also receive input from KDE and local advisory committees.

Local Area Vocational Education Centers. As is required of all CTE programs by 705 KAR 4:231, LAVECs must have an advisory committee composed of "business and industry representatives, parents, education representatives, and, if applicable to the program area, labor organizations representatives to assist in planning, implementing, and evaluating programs." Decisions about management of resources, personnel, and curriculum in LAVECs and other local CTE centers are ultimately made by building principals with oversight from the district and the local board. Superintendents in two site-visit districts that had switched from ATCs to LAVECs explained that the local control over personnel and curriculum was the primary factor motivating the decision.

Although KDE staff do not have any direct influence over the pathways offered in LAVECs or other local CTE centers, they encourage LAVECs and other local CTE centers to consult local labor market data and to align the pathways offered with workplace demand.

As with all high school courses, most decisions about CTE classes to be offered in comprehensive high schools are made by school-based decision-making councils.

Comprehensive High Schools. As with all high school courses, decisions about CTE classes to be offered are made ultimately by local school-based decision-making councils. In some cases, a local school board may elect to provide funding for a specific CTE position. In that case, authority to approve the position would rest with the local school board.

Desire For Local Decision Making

Administrators interviewed or surveyed for this study expressed a preference for local control in CTE decisions about curriculum and personnel. Agriculture pathways were mentioned more than any others as valuable pathways that are not recognized as HWHD.

Administrators interviewed during OEA site visits as well as many principals responding to OEA's survey expressed discontent at what they perceived as a disconnect between determinations of pathways and need at the state versus local levels. They gave examples of local industry or community needs that are met by pathways not considered HWHD or not in the program of studies. In one ATC district, for example, a pathway that was highly valued by a local manufacturer was discontinued at the state level. Several central Kentucky principals mentioned the need for pathways related to the equine industry, and several others who were located next to major tourist centers identified the need for hospitality pathways. Agriculture pathways were mentioned more than any others as valuable but not recognized as such by KDE. As explained by one principal,

> In our county, 1 out of every 12 jobs is directly related to agriculture. Agriculture "touches" every sector of life including the areas that have been identified as high growth/high demand, yet we cannot offer those courses in an agriculture context because they are not in an approved pathway.

CTE Access

Figure 1.A shows which types of CTE schools are available to students in Kentucky districts. It distinguishes ATCs, LAVECs, and "other" districts, such as Oldham County, that finance their own career and technical center, or those like Ashland Independent that provide CTE only in comprehensive high schools. Appendix C contains a complete accounting by district of CTE delivery options.

Figure 1.A
CTE Governance And CTE Access
Kentucky Districts
2018

Note: Italics indicate independent school district; CTE = career and technical education; ATC = area technology center; LAVEC = local area vocational education center.
Source: OEA analysis of data from the Kentucky Department of Education.

CTE Finances

ATCs receive about 5 times as much state CTE funding per pupil as LAVECs.

A 2019 OEA report, *Revenues And Expenditures For Career And Technical Education In Kentucky,* reviews Kentucky's financing of CTE and describes in detail the total state funding for CTE and methods by which that funding is distributed to ATCs, LAVECs, and districts.[4] Particularly relevant to this study are data showing that ATCs receive approximately 5 times as much state CTE funding per pupil as LAVECs.[5]

Unlike the Support Education Excellence in Kentucky funding formula, state CTE funding is not adjusted for district wealth.

Unlike the Support Education Excellence in Kentucky (SEEK) funding formula, which awards higher proportions of state funding to lower-wealth districts, state funding for ATCs and LAVECs is not adjusted for district wealth. Appendix D shows the per-pupil property assessment of districts by CTE delivery type. It shows that LAVECs and ATCs each serve higher- and lower-wealth districts. This means that LAVECs, which receive less state funding, include some of the state's least wealthy school districts, such as Magoffin, McCreary, and Carter Counties. ATCs, which are almost exclusively state funded, include some of the state's wealthiest districts, such as Campbell, Boone, and Shelby Counties.

Also noted in OEA's report is the fact that state funding for CTE covered only about one-third of districts' CTE transportation costs in 2018. District costs were reimbursed at that level independent of total transportation costs or district wealth. Under the current method for funding transportation, poor and rural districts that transport students may be absorbing greater costs than wealthier urban districts with shorter travel distances.

Expanding Access To High-Wage High-Demand Pathways

Chapter 2 reports financial challenges in expanding access to CTE pathways, especially in the costlier program areas of manufacturing, transportation, and construction. Relevant to this challenge, the New Skills for Youth grant, described below, encourages regional collaboration to expand access to HWHD pathways. The Kentucky Work Ready Skills Initiative provides state bonds for regional cooperatives to address equipment and infrastructure needs in adding new pathways, and the Kentucky Work Ready Scholarships cover tuition for graduates pursuing credentials in HWHD sectors.

The New Skills for Youth grant encourages regional collaboration on CTE delivery.

New Skills For Youth. Kentucky has received two rounds of grants from JP Morgan Chase & Co. to promote cooperation

among school districts, employers, and postsecondary institutions in the development of regional approaches, including regional academies, in the delivery of CTE. The initial grant of $100,000 in 2016 and the second grant of $2 million in 2017 support grantees in their efforts to align high school CTE with workforce demand in HWHD jobs. The grants, which are a collaboration of JP Morgan Chase & Co, the Council of Chief State School Officers, and Advance CTE, promote sharing of resources and articulation of high school CTE programs with postsecondary degrees and certificates.

The Kentucky Work Ready Skills Initiative provides state bonds for regional cooperatives to address equipment or infrastructure needs in expanding CTE to prepare students for HWHD jobs.

Kentucky Work Ready Skills Initiative. Through the Kentucky Work Ready Skills Initiative, 40 applicants have been awarded a total of $100 million in state bonds to assist school districts and KCTCS toward adding or upgrading facilities and equipment. Grants must be used to develop strategies to meet regional workforce needs in collaboration with education agencies, employers, and other regional or local partners.

The Kentucky Work Ready Scholarships cover tuition for qualified graduates pursuing credentials in HWHD sectors.

Kentucky Work Ready Scholarships. The Kentucky Work Ready Scholarship program provides scholarships that cover tuition for certificates, diplomas, and associate's degrees for qualifying individuals in HWHD sectors. The scholarships also cover the cost of dual credit classes in these HWHD sectors for high school students whose tuition is not otherwise covered.

Workforce Demand And Pathway Completion

Workforce Demand

Figure 1.B shows the number of job openings projected for 2018-2022 in Kentucky by major occupation group and skill level. KYSTATS provides these projections based on a combination of data from the Kentucky Longitudinal Data System and the Bureau of Labor Statistics. The projected openings within each occupation group are divided among jobs that are low, medium, or high skilled, based on the education required for those jobs as reported by employers. Low-skilled jobs are those that require only a high school diploma or less. Medium-skilled jobs require postsecondary education but less than a bachelor's degree. High-skilled jobs require a bachelor's degree or above.[k]

[k] Also included in this group are jobs identified by KDE as favoring applicants with certain certifications that can be obtained in high school. These occupations include carpenters, electricians, plumbers, welders, machinists, and maintenance and repair workers.

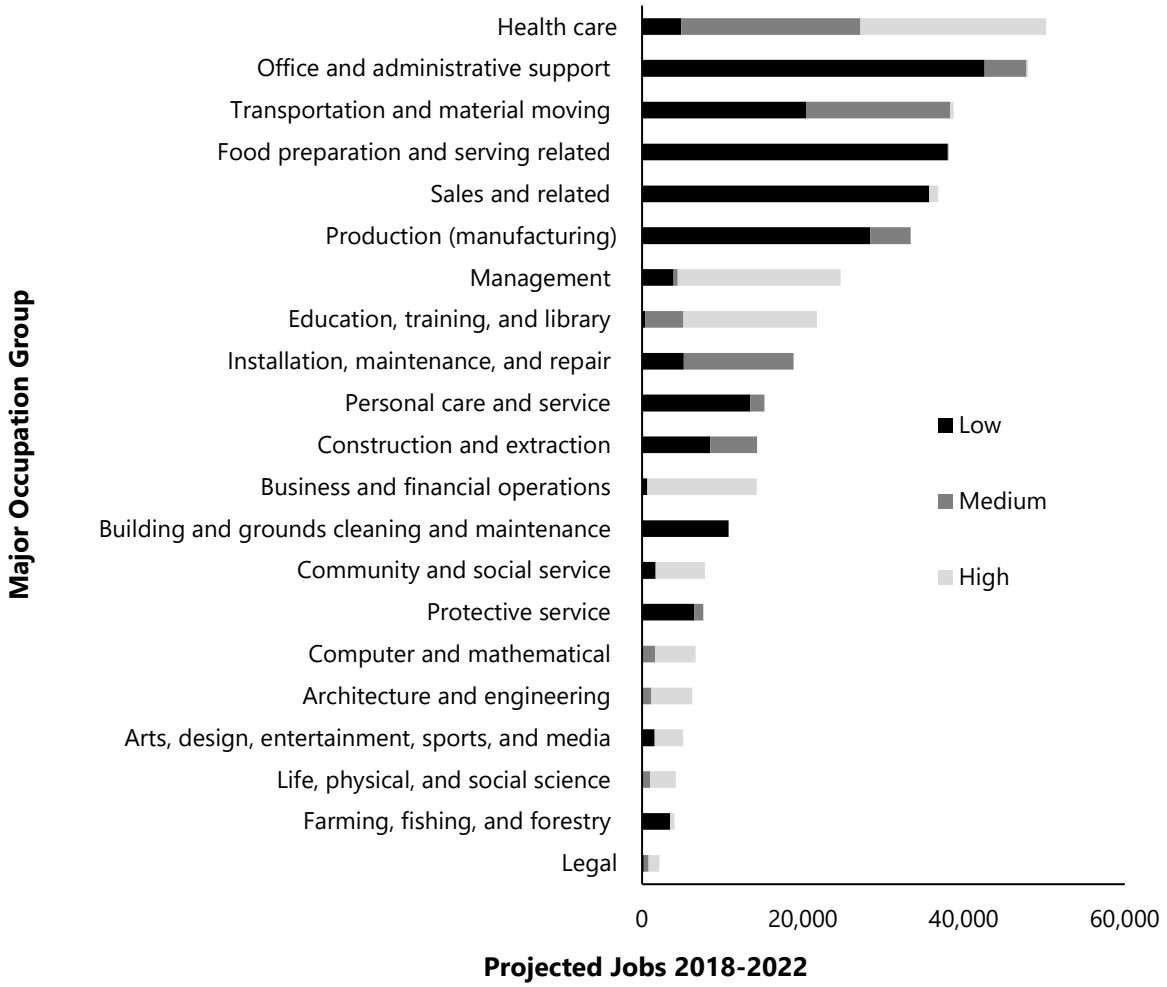
Approximately two-thirds of Kentucky's projected jobs for 2018-2022 require no education beyond high school.

Approximately two-thirds of the projected jobs for 2018-2022 require no education beyond high school. Three of the highest-demand occupation groups—office and administrative support, food preparation and serving, and sales—do not pay high wages and are therefore not considered HWHD.

In the HWHD sectors of health and business, most jobs will require at least some education after high school.

In the HWHD sectors of health and business, most jobs will require at least some education after high school. These data will be important to keep in mind when examining data reported in Chapter 3, which shows the relatively low wages earned by most graduates from those pathways, who are working without a postsecondary degree or certificate. Of the HWHD sectors, manufacturing, construction, and transportation have greater percentages of jobs that will not require postsecondary education.

Figure 1.B
Projected Job Openings By Major Occupation Group And Skill Level
2018-2022



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

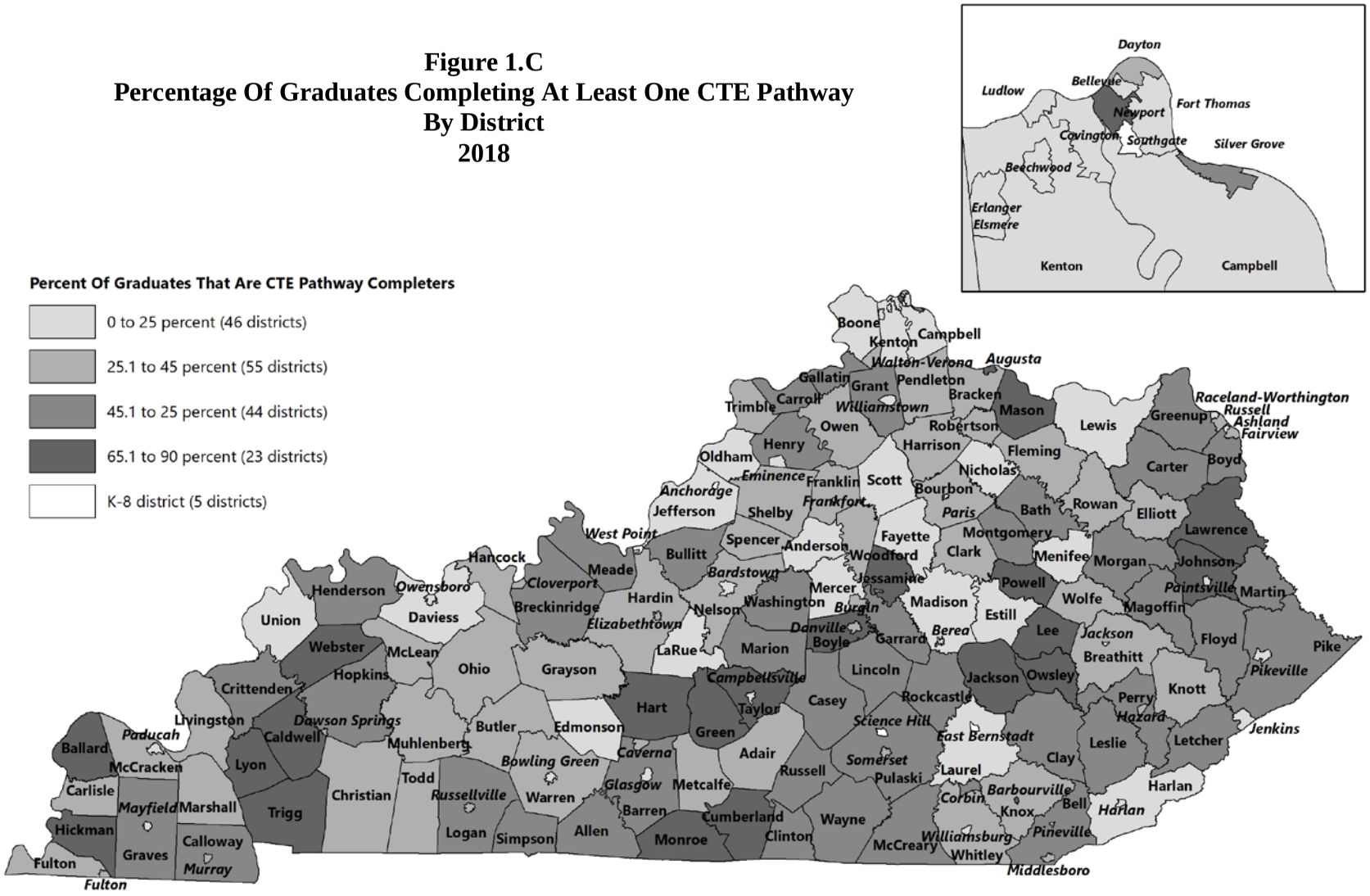
CTE Pathway Completion By District

Statewide, 33 percent of graduates completed at least one career pathway in 2018. Percentages range broadly among districts, from less than 5 percent to 88 percent. Pathway completion rates are relatively lower in the state's larger, more urban districts.

Figure 1.C shows, by district, the percentages of graduates who completed at least one career pathway in 2018. Statewide, 33 percent of graduates completed a pathway in 2018. Percentages range broadly among districts, from less than 5 percent in some of the state's small, independent districts to as high as 88 percent in some of the state's other, mostly rural districts.[1] CTE pathway completion rates are lower in the state's larger, more urban districts, including Jefferson (19.8 percent) and Fayette (12.5 percent) Counties.

[1] A principal from Meade County High School noted that the school requires all graduates to complete a pathway. It is possible that other high schools do the same. The OEA survey did not ask that question specifically.

Figure 1.C
Percentage Of Graduates Completing At Least One CTE Pathway By District
2018



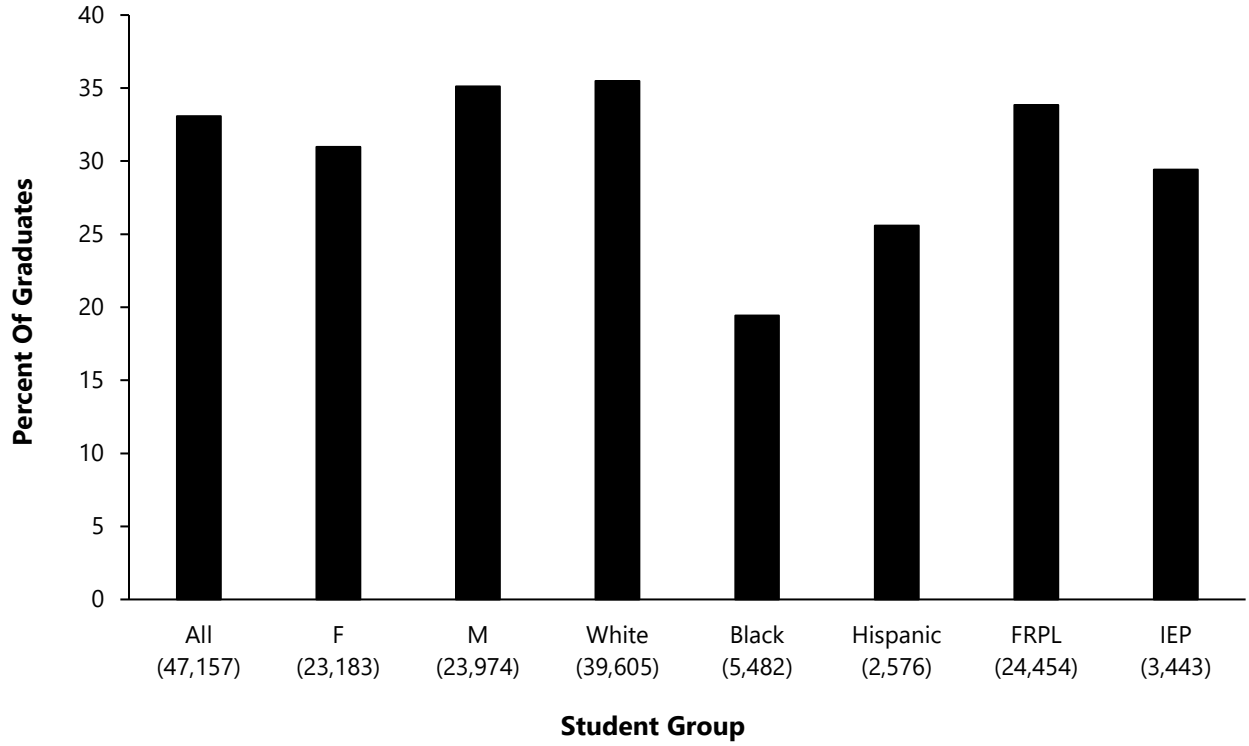
Note: Italics indicate independent school district; CTE = career and technical education.
Source: OEA analysis of data from the Kentucky Department of Education.

CTE Pathway Completion By Student Demographic Characteristics And Program Eligibility

Female graduates completed pathways at a lower rate than male graduates. Compared to white students, black and Hispanic students completed pathways at lower rates.

Figure 1.D shows the percentage of graduates, by student demographic characteristics and program eligibility, who completed pathways in 2018. Female graduates completed pathways at lower rates than male graduates (31 percent versus 35 percent). Compared to white students (35 percent), black and Hispanic students completed pathways at much lower rates (19 percent and 26 percent, respectively).[m]

Figure 1.D
Percentage Of Graduates Completing At Least One CTE Pathway By Student Demographic Group And Program Eligibility 2018



Note: FRPL = students eligible for free or reduced-price lunch; IEP = students eligible for individualized education programs (special education students). Most students are counted in more than one group.
Source: Staff analysis of data from the Kentucky Center for Statistics.

[m] One factor that might partially explain the much lower rates of black graduate pathway completion is the high concentration of black students in Fayette and Jefferson Counties, both of which have pathway completion rates that are much lower than the state's.

Chapter 2 looks at pathway completion by program area in comparison to workforce demand data shown in this chapter. It also looks at differences among regions and student groups in the percentage of graduates completing pathways in specific program areas.

Chapter 2

CTE Completion By Program Area

This chapter focuses on CTE enrollment trends by program area, demographic group, and school type. It also reports CTE pathway completers' attainment on additional high school indicators.

This chapter shows the number of high school graduates completing CTE pathways in specific program areas and compares them, as a percentage of all graduates, with the percentage of jobs projected in corresponding industry sectors. It also shows differences in completion rates based on student demographic characteristics, the type of CTE school students attend, and geographical location. The chapter concludes by reporting CTE completers' attainment on additional high school indicators—performance-based assessments, dual-credit classes, and cooperative work credits.

Chapter 3 shows that, of the HWHD program areas, manufacturing, transportation, and construction pathways are associated with higher wages than are business and health pathways. Agriculture pathways, which are not generally considered HWHD, are also associated with higher wages.

Relevant to the CTE completion data reported in this chapter are findings that are reported in Chapter 3, related to outcomes of graduates who complete CTE pathways in particular program areas. Chapter 3 shows that, of the program areas that have been identified as HWHD, wages are much higher for graduates who completed manufacturing, transportation, and construction pathways than for completers of health or business pathways. It also shows relatively high wages for agriculture pathway completers, though agriculture is not considered HWHD.

CTE Pathways Completed Relative To Demand

Pathways Completed 2018

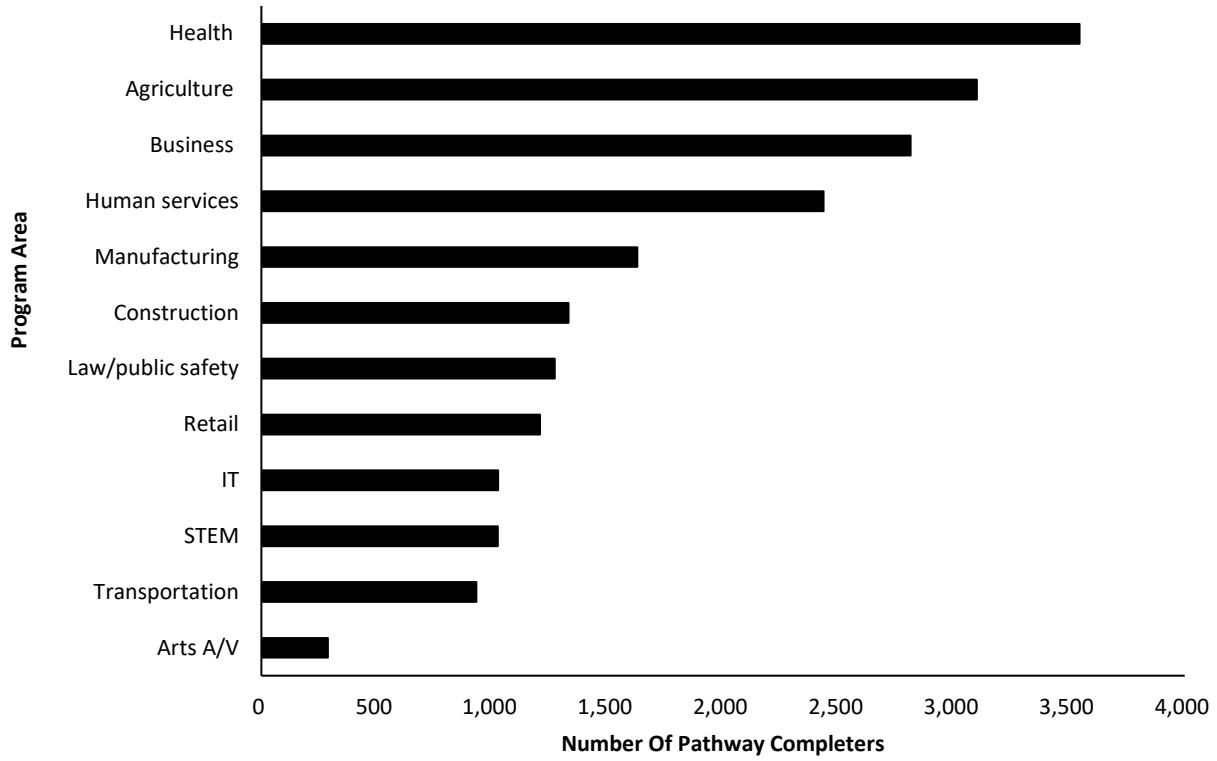
The number of graduates completing health pathways was greater than the number for any other program area and was 2 to 4 times the number for those completing manufacturing, construction, and transportation pathways.

Figure 2.A shows the total number of pathways, by program area, completed by graduates in 2018. In that year, graduates completed a total of over 20,000 individual pathways, with many completing more than one pathway. The figure shows that three of the five program areas with the greatest number of pathway completers are HWHD sectors (health, business, and manufacturing) though the other two pathways (agriculture and human services) are not HWHD. Graduates completing health pathways far outnumbered those in all other program areas and were substantially more numerous than those completing pathways in manufacturing (2.2 times), construction (2.7 times), or transportation (3.8 times).

Of the program areas not identified as HWHD, agriculture had the greatest number of completers.

Of the program areas that have not been identified as HWHD, agriculture pathways had the greatest number of completers in 2018.

Figure 2.A
Total Number Of Pathway Completers By CTE Program Area
2018 Graduates



Note: Many graduates completed more than one pathway. In some cases, graduates completed more than one pathway in an individual program area. IT = information technology; STEM = science, technology, engineering, and math; A/V = audiovisual technology.
Source: Staff analysis of data from the Kentucky Department of Education.

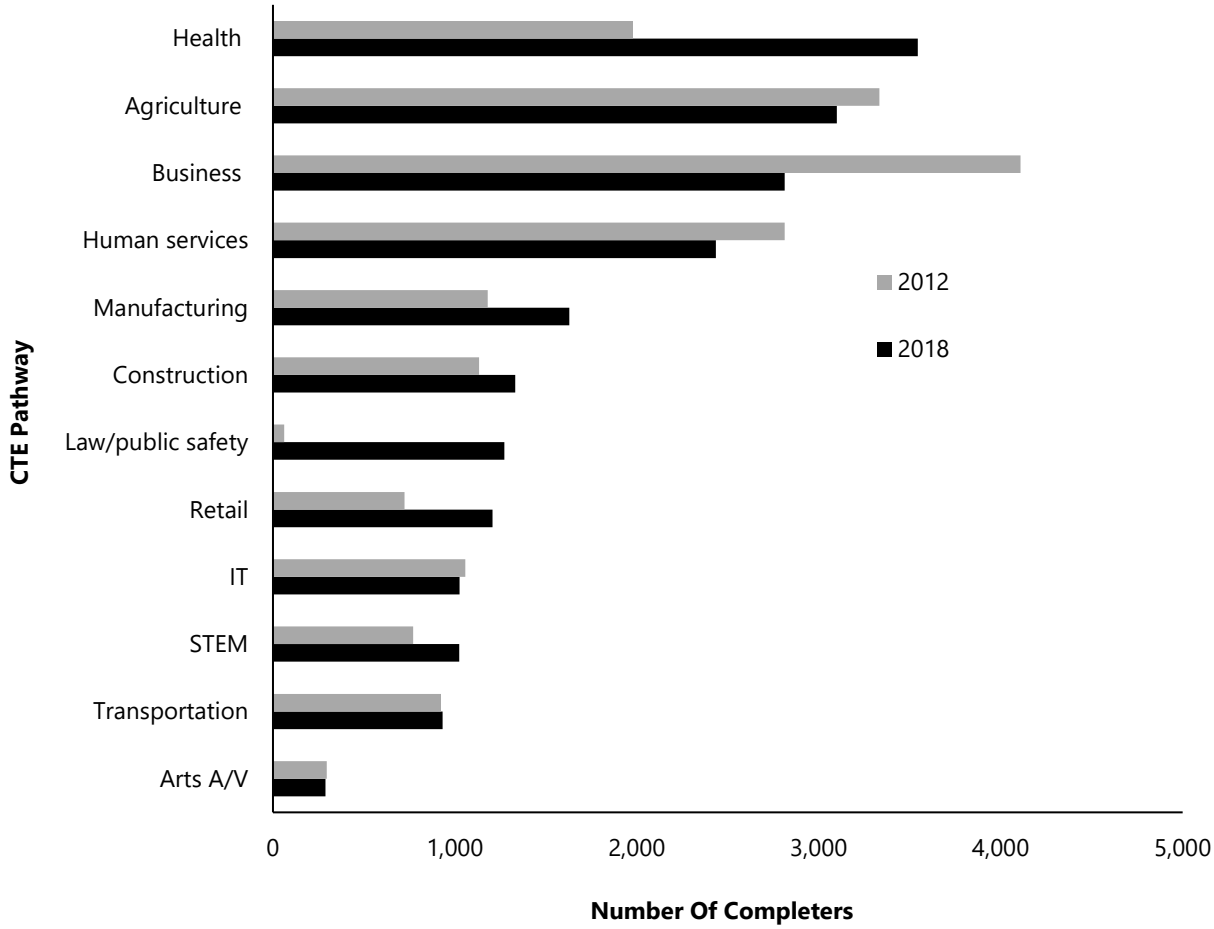
Pathway Completers 2012 To 2018

Between 2012 and 2018, health pathway completion has grown the most, increasing by over 1,500 students or 79 percent. The increase in health pathway completers is more than double the total combined increase in manufacturing, construction, and transportation pathways.

Between 2012 and 2018, the total number of pathway completers increased by 12 percent. As shown in Figure 2.B, increases have been primarily in the HWHD program areas. Health pathway completions have grown the most, increasing by a total of 1,567 students or 79 percent. The increase in the total number of additional health pathway completers is 2.4 times the total number of additional pathways in the manufacturing, transportation, and construction pathways combined. Increases in these pathways were 38 percent in manufacturing, 18 percent in construction, and 1 percent in transportation. Completion of business pathways, following national trends, has decreased.

Outside the HWHD program pathways, retail pathways have increased by 40 percent and science, technology, engineering, and math (STEM) pathways have increased by 25 percent. Law and public safety programs, which comprise primarily Reserve Officer Training Corps programs, had relatively few pathway completers in 2012 and had 1,271 completers in 2018, similar to the number of construction pathway completers.

Figure 2.B
Total Number Of Pathway Completers By CTE Program Area
2012 And 2018



Note: CTE = career and technical education; IT = information technology; STEM = science, technology, engineering, and math; A/V = audiovisual technology.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Pathway Completion Relative To Workforce Demand

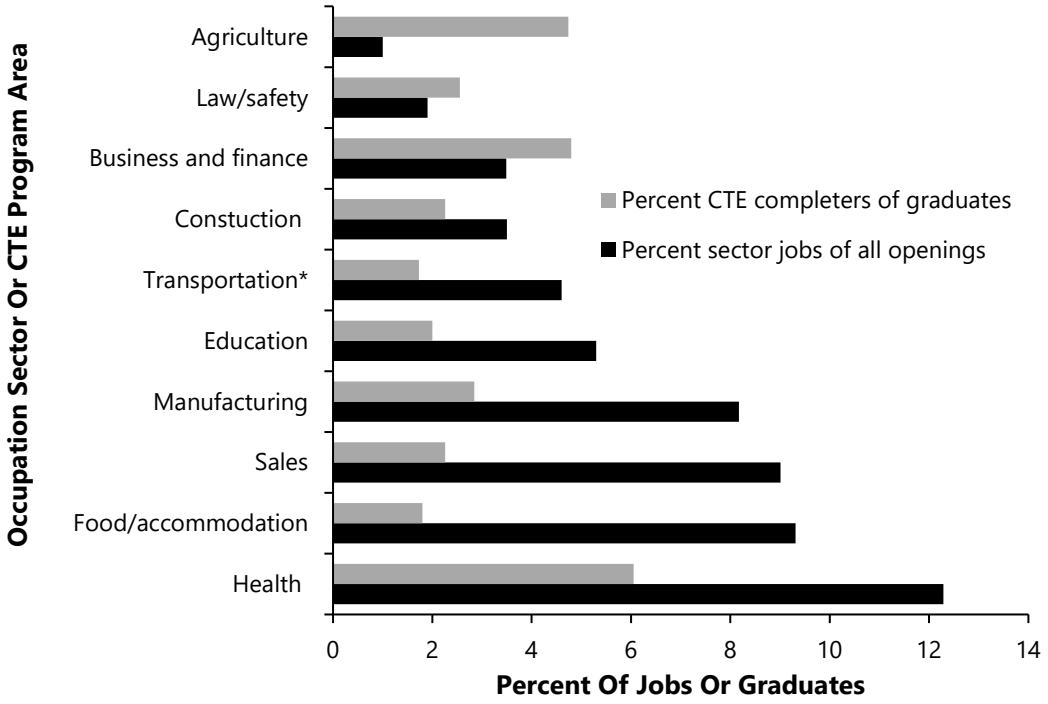
Figure 2.C compares the percentage of 2018 graduates completing pathways in particular program areas with the percentage of jobs in the closest corresponding workforce occupation group, as projected by the Kentucky Future Skills Report described in Chapter 1.[a]

With the exception of business, the percentages of new jobs projected in HWHD industry sectors exceed the percentages of high school graduates completing pathways in related program areas. Relative to demand, enrollment in manufacturing and transportation pathways is especially low.

With the exception of business, the percentages of new jobs projected in HWHD industry sectors exceed the percentages of high school graduates completing pathways in related programs. Relative to demand, enrollment in manufacturing and transportation pathways, especially, is low. While over 8 percent of new jobs are projected to be in manufacturing, less than 3 percent of graduates in 2018 completed a manufacturing pathway. While 4.6 percent of occupations are in auto or other repair and installation, only 1.7 percent of graduates completed transportation pathways.

[a] Measurement issues make exact comparisons of pathway enrollment versus industry demand impossible. Job class codes do not align directly with academic course codes. For example, some of the occupations in the repair and installation group correspond more closely with pathways that are considered construction pathways. Further, it is likely that many of the skills acquired in some pathways are transferable among industry sectors.

Figure 2.C
Percentage Of Projected Job Openings By Occupation, 2018-2022, And High School CTE Completers Of Related Programs As A Percentage Of High School Graduates 2018



Note: CTE = career and technical education.
* No Kentucky Future Skills Report (KFSR) occupation sectors are a close match with the CTE transportation program pathways. The transportation occupations comprise largely drivers, freight movers, and other occupations that do not correspond with training received in transportation pathways, which are most often related to auto mechanics and repair. Because the KFSR major occupation most closely corresponding with CTE transportation pathways is installation, maintenance, and repair, OEA reports projected jobs in this occupation group in calculating the percent of job openings in transportation. The installation, maintenance, and repair occupation group also contains occupations, such as heating, ventilation, and air conditioning repair, that would align with construction pathways.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Variation In Supply Versus Demand By Local Workforce Area

The percentages of graduates completing pathways in the various program areas relative to demand vary considerably by local workforce area (LWA).

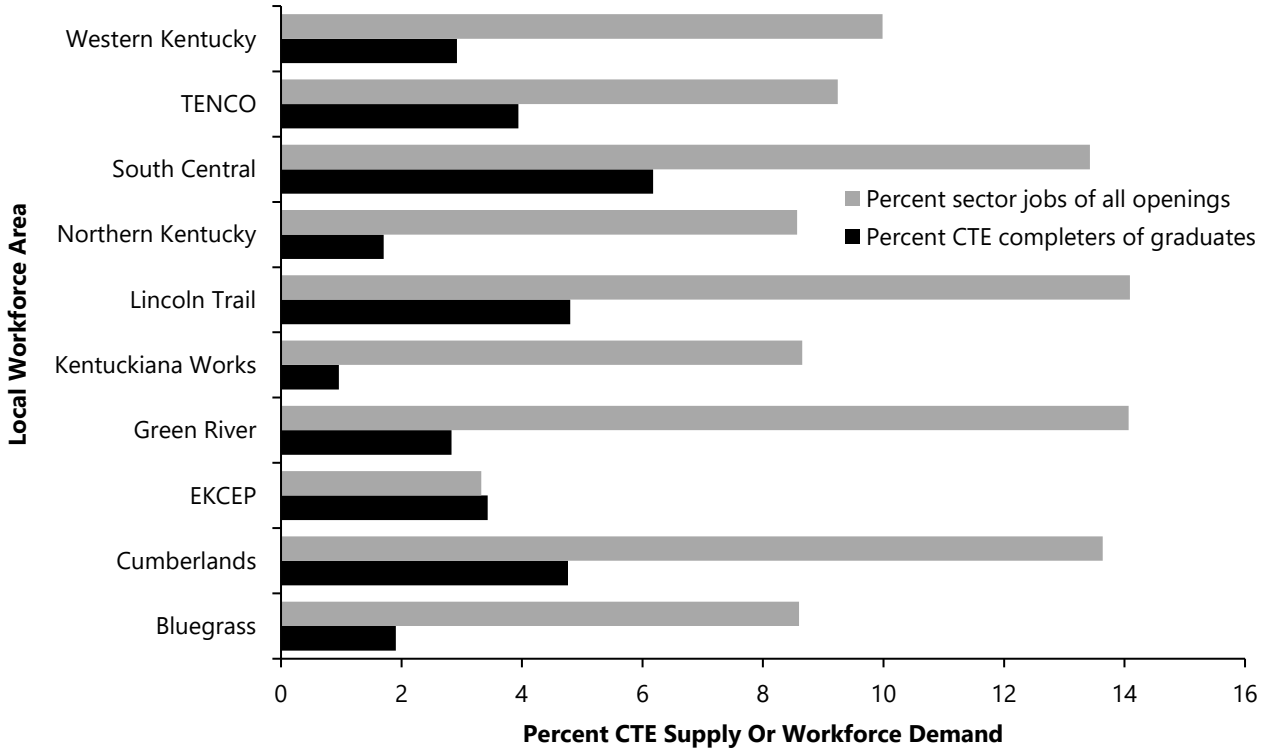
As shown in Appendix E, the percentages of graduates completing pathways in the various program areas relative to demand vary considerably by LWA. Health pathways are relatively common in every LWA but range from 4 percent in Northern Kentucky to 11 percent in the Eastern Kentucky Concentrated Employment Program LWA. The West and South-Central LWAs have higher percentages of graduates who complete agriculture pathways than other LWAs. Manufacturing, construction, and transportation vary

considerably, with pathway completion being extremely low in some LWAs.

The South Central LWA has the highest percentages of graduates completing manufacturing pathways. Percentages are lowest in the LWAs that contain the state's largest districts.

Supply And Demand By Local Workforce Area. Figure 2.D shows supply versus demand by LWA in manufacturing pathways and occupations. The South Central LWA had the highest percentage of graduates completing manufacturing pathways and is one of the LWAs with the greatest demand for manufacturing occupations. Relative to demand, pathway completions are especially low in the LWAs that contain the state's largest districts: Kentuckiana Works (which includes Jefferson County), Northern Kentucky, and Bluegrass (which contains Fayette County). As shown in Chapter 1, CTE pathway completion generally, as a percentage of graduates, is lower in most of the state's larger and more urban school districts.

Figure 2.D
Percentage Of Graduates Completing Manufacturing Pathways In 2018 And Percentage Of Projected Jobs In Related Manufacturing Occupations 2018-2022 By Local Workforce Area



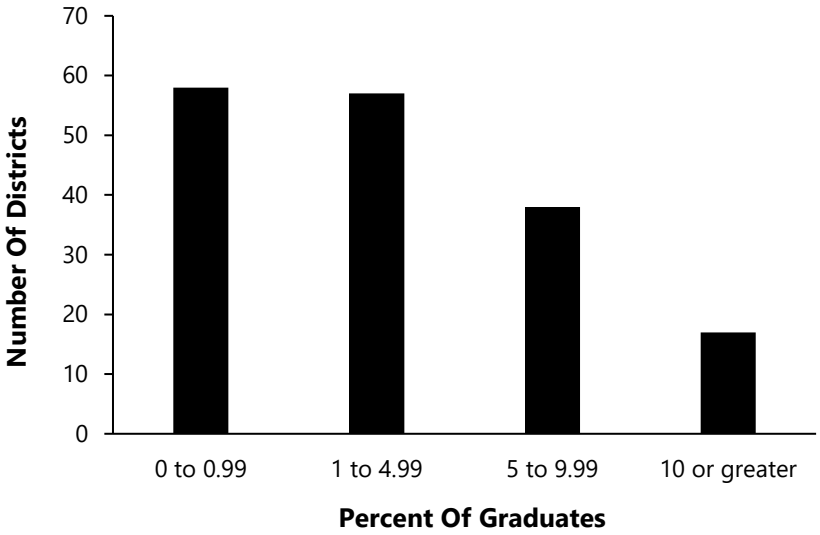
Note: CTE = career and technical education.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Manufacturing Completers By District

In the state's two largest districts—Jefferson and Fayette Counties—less than 1 percent of graduates completed manufacturing pathways.

As shown by Figure 2.E, in over one-third (58) of school districts, the percentage of graduates completing manufacturing pathways is less than 1 percent. Jefferson and Fayette Counties, the state's two largest school districts, fall in this range. These two school districts also graduate the largest number of black students in the state. As shown later in this chapter, black graduates complete manufacturing pathways at less than one-third the rate of white graduates.

Figure 2.E
Number Of Districts By Percentage Of Graduates Completing Manufacturing Pathways
2018



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

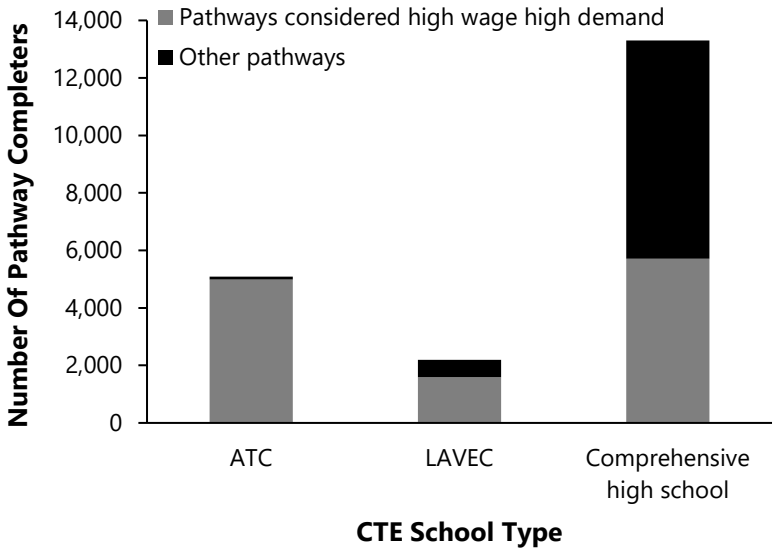
Program Completion By CTE School Type

Almost all (98 percent) of pathways completed in ATCs were in HWHD program areas, compared with 73 percent in LAVECs and 43 percent in comprehensive high schools.

Figure 2.F shows the total number of pathway completers in program areas considered HWHD versus other pathways in each of the state's CTE school types. It shows that graduates completing pathways in ATCs are more likely to do so in HWHD program areas compared to those completing pathways in other schools. Statewide, 60 percent of pathways completed in 2018 were in HWHD program areas. Almost all (98 percent) pathways completed in ATCs were in HWHD program areas, compared with

73 percent in LAVECs and 43 percent in comprehensive high schools.[b]

Figure 2.F
Number Of Pathway Completers
By School Type And High Wage High Demand Designation
2018



Note: ATC = area technology center; LAVEC = local area vocational education center; CTE = career and technical education.
Source: Staff analysis of data from the Kentucky Center for Statistics.

As shown in Chapter 3, however, not all of the pathways that are considered HWHD have resulted thus far in higher wages for most graduates. Health pathways, in particular, are associated with relatively low wages. Conversely, agriculture pathways, most of which are not considered HWHD, have been associated with higher wages.

CTE Completion By Program Area

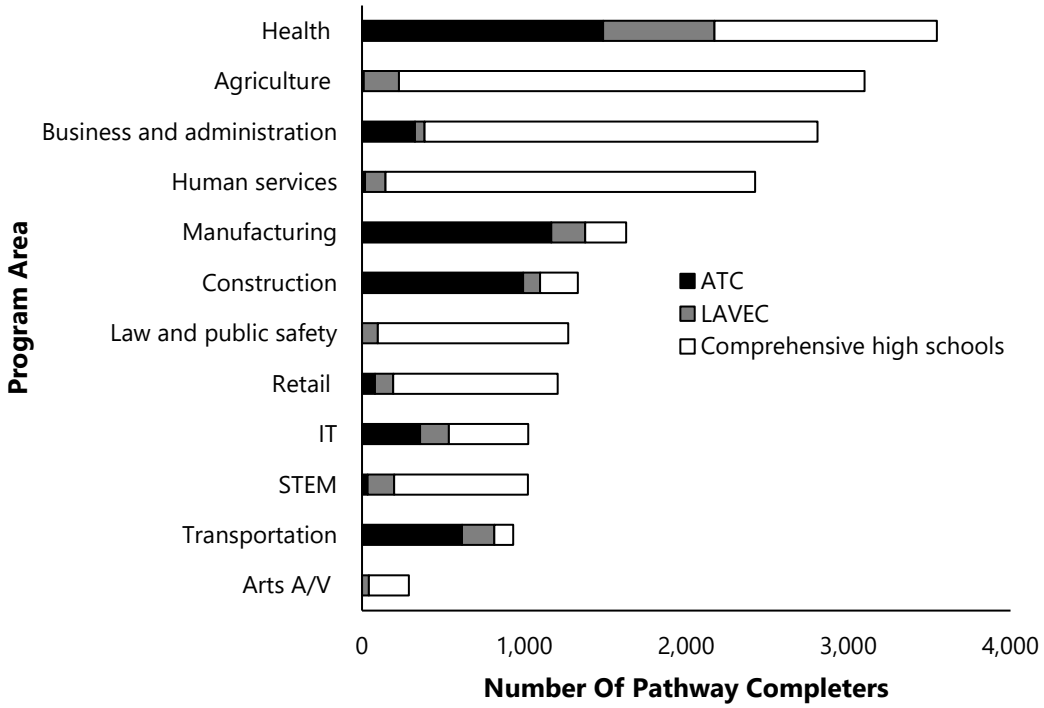
Health science pathway completion is common in all schools, whereas pathway completion in manufacturing, transportation, and construction is concentrated in ATCs.

Figure 2.G shows the number of pathway completers by program area and type of school in which pathways were completed in 2018. It shows that, of the HWHD program areas, health science pathway completion is common in all three types of CTE school locations, whereas pathway completers in manufacturing, transportation, and construction are concentrated in ATCs.

[b] Some of the pathways counted as "other pathways" in the figure are considered HWHD in KDE's updated list of approved industry certificates. These include Agricultural Power Structural Technical Systems (agriculture), Engineering (STEM), and early childhood education (human services).

Agriculture, business administration, and human services completers are concentrated primarily in comprehensive high schools.

Figure 2.G
Number Of Pathway Completers By Program Area And CTE School Type
2018



Note: ATC = area technology center; LAVEC = local area vocational education center; IT = information technology; STEM = science, technology, engineering, and math; A/V = audiovisual technology.
Source: Staff analysis of data from the Kentucky Center for Statistics.

As stated earlier, the total number of pathway completers varies substantially by school setting and is greatest in comprehensive high schools, followed by ATCs and LAVECs. It is important, therefore, to interpret the data in Figure 2.G as a percentage of completers in each school setting. Appendix F shows pathway completers in this way.

Health pathways make up the highest percentage of pathways completed in both ATCs and LAVECs, at about 30 percent. Compared with LAVECs, ATCs have a much higher percentage of completers in manufacturing (23 percent versus 9 percent) and construction (20 percent versus 5 percent). LAVECs offer a greater variety of programs that are not offered in any ATCs, including agriculture (10 percent), human services (6 percent), retail

(5 percent), and law and public safety (4 percent). Students in comprehensive high schools are most likely to complete pathways in agriculture (22 percent), business and administration (18 percent), and human services (17 percent).

Causes Of Variation In Pathways Offered By School Type

Several factors influence the differences in the pathways offered in Kentucky's different CTE settings. Of these, the relatively high cost of equipment and supplies in some pathways versus others appears to be a major factor. Also important are differences among school types in the ultimate authority to add or remove pathways at the state versus local levels and in differences among school settings in the likelihood that students are interested in and will enroll in the different pathways.

Funding

The relatively high concentration of higher-wage pathways in ATCs compared with LAVECs and comprehensive high schools likely reflects differences in CTE funding. The costs of starting up a pathway are higher in manufacturing, transportation, and construction than in health or business pathways.

The relatively high concentration of manufacturing, construction, and transportation pathways in ATCs versus LAVECs and comprehensive high schools likely reflect differences in the way CTE is funded in these settings. ATCs received approximately 5 times as much state funding per pupil each year as LAVECs.[6] The costs of starting up a pathway are generally much higher in manufacturing, construction, or transportation than in business or health. Compare, for example, the costs of beginning a Truck Service Technology Technician pathway ($276,000), Welder-Entry Level ($424,000), or Industrial Electrician Assistant ($189,000), versus Pre-Nursing ($68,000), or Retail Services ($47,000).[7]

Compared to ATCs, principals of LAVECs and comprehensive high schools were more likely to report barriers, including costs, in offering new pathways.

Barriers To Starting CTE Programs. Compared to principals of ATCs, principals of LAVECs and comprehensive high schools responding to OEA's 2019 survey were more likely to report barriers in beginning new CTE pathways, with lack of necessary supplies and equipment being generally the most commonly reported barrier, followed by the inability to find a qualified teacher. The programs most frequently reported by principals as lacking because of this barrier were manufacturing, transportation, and engineering programs in comprehensive high schools and construction, transportation, manufacturing, and media arts in LAVECs. Appendix G shows the number of respondents reporting barriers by school type and program area. OEA survey responses from two LAVEC principals illustrate this challenge. One explained: "Manufacturing and transportation is a high demand pathway for our area. We cannot fund those programs at our

school." Another LAVEC principal in one of the state's lowest wealth districts explained that cost is a barrier, adding "I would love for our county to offer: [heating, ventilation, and air conditioning], plumbing, electricity, machine tool, [emergency medical technician], pharmacy technician, and media arts."

Principals of small schools or schools in small independent districts identified special challenges in providing students with sufficient choice and opportunities in CTE pathways. They mentioned size, funding, and in some cases their rural or remote location as barriers.

Pathway Approval Process

KDE has authority to approve pathways offered in ATCs and has prioritized HWHD pathways.

The overwhelming majority of ATC and LAVEC principals (75 percent and 79 percent, respectively) identified local industry need as the most critical factor in determining what pathways to offer. As noted in Chapter 1, however, ultimate authority for pathway approval differs among CTE school types. Authority to approve new pathways for ATCs rests ultimately with KDE, whereas authority to approve new pathways for LAVECs rests with local districts and school boards. Because KDE approves only pathways that are considered HWHD, it is not surprising that the number of different program areas is lower in ATCs than in LAVECs.

Student Interest

More than half of principals in all school types reported that student interest is a deciding factor in the decision to add a new pathway.

Student interest was reported by over 50 percent of principals in all school types as a deciding factor in decisions about whether to add a pathway. Student interest was the most frequently cited deciding factor by comprehensive high school principals. As compared with ATCs and LAVECs, CTE classes in comprehensive high schools serve a broad range of students and include those who take CTE classes for elective credit and not as a route to pathway completion. Comprehensive high school principals cited the importance of CTE classes as a way of engaging students who might otherwise not be interested in school and as a critical factor in encouraging school attendance and support toward high school graduation. During OEA site visits, many principals reported that they were seeking consumer and family science teachers because these classes served such an important function for students, independent of specific preparation for the workforce.

In some cases, a class may be reported as in demand by local workforce representatives but not popular with students. Unlike

academic classes, which students are required to take in order to graduate from high school, CTE classes are not guaranteed student attendance, and most schools cannot afford to maintain classes with low attendance. KDE has a policy of closing CTE programs at ATCs that fall below a student-to-teacher ratio of 12.5.[8] One superintendent reported that the district, at the request of a local aviation board, had added an aviation pathway, at great expense. Ultimately, the pathway was not popular with students, and the district could not afford to maintain it. Thus, the initial investment in the expensive equipment for the pathway was lost. Across school settings, health was among the pathways least likely to be identified as lacking in student interest.

Strategies reported by some districts in generating student interest included field trips, industry fairs, and guest speakers such as industry representatives or recent graduates.

Strategies Employed By Districts To Generate Student Interest. The OEA survey did not specifically ask principals to explain strategies used to generate student interest. Several explained that recruitment and engagement are central to the CTE programs in their districts. Strategies include guest speakers such as industry representatives or recent graduates working in those industries, field trips to local industries, and industry fairs. For example, one explained that

> [w]e are building partnerships with community leaders and work closely with the Chamber of Commerce to expose students to local careers and to build a local workforce. Industry tours and guest speakers are a regular part of our curriculum. [We also utilize] project based learning.

Another reported that the district uses a

> mock interview process with all juniors and seniors (industry partners involved in the process); industry projects and connections to on-the-job learning through partnerships with companies; soft skills/work-ready skills curriculum in all programs; and 8th grade advanced manufacturing rotation program to allow students to explore careers and skills in our most sought after jobs in this community.

Variation In Pathway Completion By Student Demographics

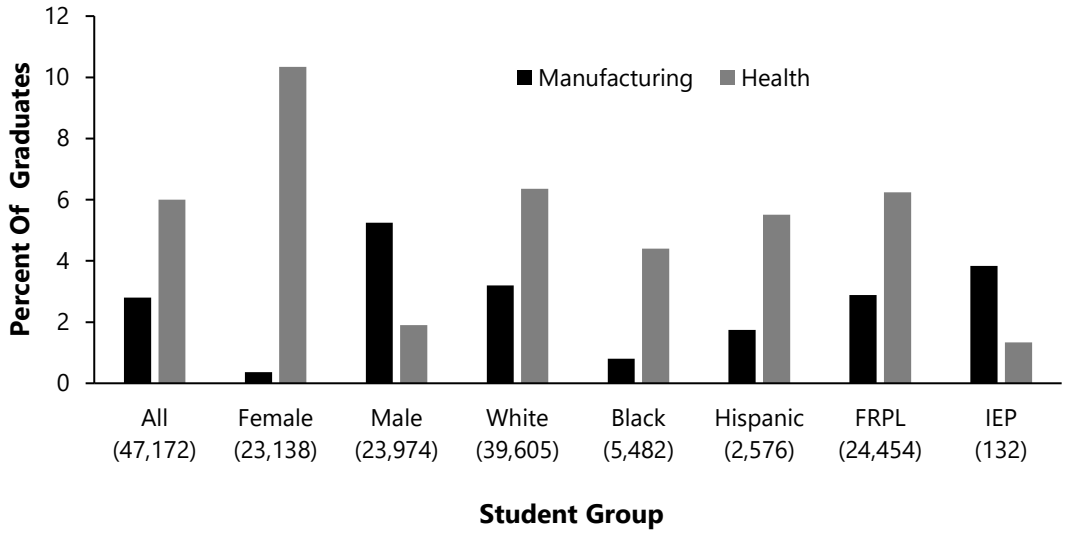
As shown in Chapter 1, female students are less likely than male students to complete CTE pathways, whereas black students and Hispanic students are much less likely to complete pathways than are white students.

Figure 2.H shows additional differences, based on student demographic characteristics and eligibility for FRPL or having an individualized education program (IEP), in the percentage of pathway completers in manufacturing or health. As shown in Chapter 3, manufacturing pathway completers earn, on average, the highest wages of all program areas, whereas health pathway completers earn, on average, the lowest of all the HWHD program areas.

Compared to all graduates, female, black, and Hispanic graduates complete manufacturing pathways at lower rates. Female and black graduates complete health pathways at higher rates.

The figure shows demographic differences in the rates at which graduates complete manufacturing and health pathways. Pathway completion in manufacturing is lower for black and Hispanic graduates than for white graduates, and for female graduates than for male graduates. Health pathway completion is higher for female graduates than male graduates and for black graduates than white graduates. Pathway completion patterns for FRPL and IEP students differ less from all CTE pathway completion patterns. Appendix H shows demographic differences in the percentage of pathway completers in other program areas.

Figure 2.H
Percentage Of All Pathway Completers In Manufacturing Or Health Pathways By Student Demographic Characteristics And Program Eligibility
2018



Note: FRPL = students receiving free or reduced-price lunch; IEP = students with individualized education programs (special education students). Most students belong to more than one group.
Source: Staff analysis of data from the Kentucky Center for Statistics

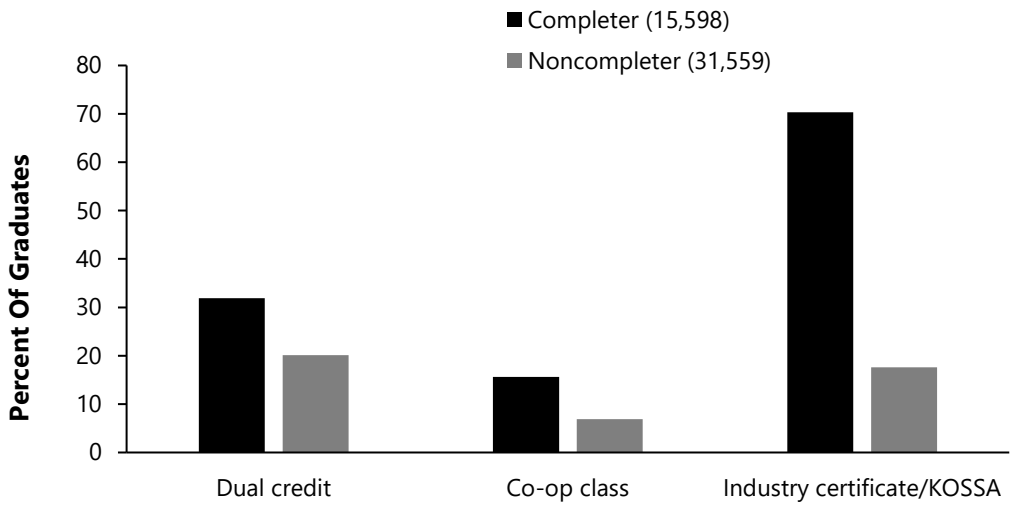
Additional High School CTE Outcomes

Figure 2.I shows the percentage of CTE pathways completers versus noncompleters attaining other outcomes related to CTE education: earning a grade of C or above in a dual-credit class, earning a cooperative work credit, or passing an industry or KOSSA exam. Cooperative education classes combine in-school instruction with job experience that is supervised by the school and employer, to ensure that work experience is related to a student's educational goals or career pathway.

CTE completers had cooperative work experiences, passed performance-based CTE assessments, and earned grades of C or above in dual-credit classes at higher rates than noncompleters.

CTE completers attained these other indicators at higher rates than noncompleters. In 2018, nearly one-third of pathway completers earned a C or above in a dual-credit class, and 70 percent earned an industry certificate or passed a KOSSA exam. At 16 percent, rates of participation in co-op classes were much lower; one possible explanation is that these experiences depend on availability of placement with local employers.

Figure 2.I
Number And Percentage Of CTE Program Completers And Noncompleters Earning A Grade Of C Or Above In A Dual-Credit Class, A Cooperative Work Credit, Or An Industry Certificate/KOSSA Exam
2018



Note: KOSSA = Kentucky Occupational Skill Standards Assessment.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix I shows variation among program areas on the indicators shown in the figure.

Work-Based Learning

Figure 2.I shows relatively low percentages of students gaining work experience by earning a credit in a cooperative education class. Other options available for CTE students to gain real-world experience through work-based learning include job shadowing, approved apprenticeships, internships, mentoring, and student-run school-based businesses, such as furniture making or culinary services (school-based enterprises). Except for cooperative education experiences and, in recent years, KDE-approved apprenticeships, data on student work-based learning are not available. As shown above, only 16 percent of CTE students in 2018 completed a cooperative work experience for credit.

The majority of principals responding to OEA's survey indicated that less than 25 percent of CTE completers had participated in work-based learning.

The majority of principals responding to OEA's survey indicated that less than 25 percent of CTE completers had the opportunity to participate in any form of work-based learning. Principals in LAVECs were more likely to report opportunities for work-based learning than were principals in the other CTE school types, and ATC principals were the least likely. The percentage of principals reporting work-based learning experiences for at least half of CTE

students was 28 percent for LAVECs, 18 percent for comprehensive high schools, and 5 percent for ATCs.

Across all settings, health sciences was the most likely to be reported as having work-based learning opportunities for students who seek them. The percentage of principals reporting that these opportunities were mostly or always available in health sciences was 65 percent for comprehensive high schools, 56 percent for LAVECs, and 42 percent for ATCs.

Chapter 3

Career And Technical Education Outcomes

Introduction

This chapter focuses on wages of CTE completers, by program area, 5 years after high school graduation. Data are most relevant for graduates who do not go on to earn postsecondary degrees. This has historically been, and is continuing to be, the majority of workers in the commonwealth.

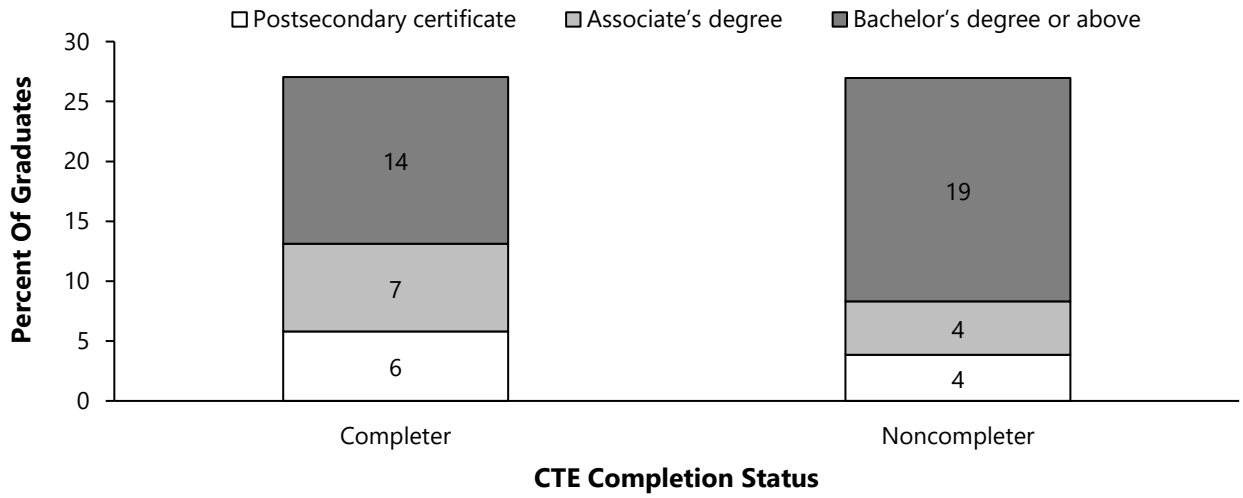
This chapter follows graduates for up to 5 years after high school graduation, showing differences in workforce participation, wages, postsecondary education, and sector of employment for graduates who completed CTE pathways versus those who did not. It looks, in particular, for differences in wages among pathways in different CTE program areas. The chapter focuses primarily on outcomes of 2013 graduates in 2018. Because the long-term effects of postsecondary education on wages are not yet evident 5 years after graduation, the data are particularly relevant to graduates who do not go on to earn postsecondary degrees. This group has historically been, and is continuing to be, the majority of workers in the commonwealth.

Postsecondary Education Outcomes

Pathway completers earned postsecondary credentials or degrees at the same rate as noncompleters but were more likely to earn postsecondary certificates and associate's degrees and less likely to earn bachelor's degrees.

Figure 3.A shows postsecondary education attainment rates of 2013 graduates through school year 2018. CTE completers earned postsecondary degrees or credentials at the same rate as noncompleters (27 percent). Compared to noncompleters, completers were, however, more likely to earn certificates (6 percent versus 4 percent) and associate degrees (7 percent versus 4 percent), and less likely to earn bachelor's degrees (14 percent versus 19 percent).

Figure 3.A
Percentage Of 2013 Graduates By Level Of Postsecondary Education Through School Year 2018, Pathway Completers And Noncompleters



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

Appendix J shows differences in postsecondary education rates among CTE programs. These rates range from 41 percent for STEM completers to 9 percent for transportation completers. Consistent with general gender-based differences in postsecondary education rates, program areas that are predominantly male, such as manufacturing, construction, and transportation, have lower postsecondary attainment rates than program areas that are predominantly female, such as retail, human services, and health.[a]

Industries Of Employment And Average Wages, All Graduates

Figure 3.B shows the major industry sectors in which 2013 graduates worked in 2018 and average wages by sector. The figure shows wages and employment sectors for all graduates, regardless of CTE completion or level of postsecondary education. Also important to note is that, while the industry sector names are similar to the CTE program names,

- the minority of workers in any of the industry sectors are CTE completers from a related program area, and
- the majority of CTE completers are not employed in the sector most closely corresponding with their program area.

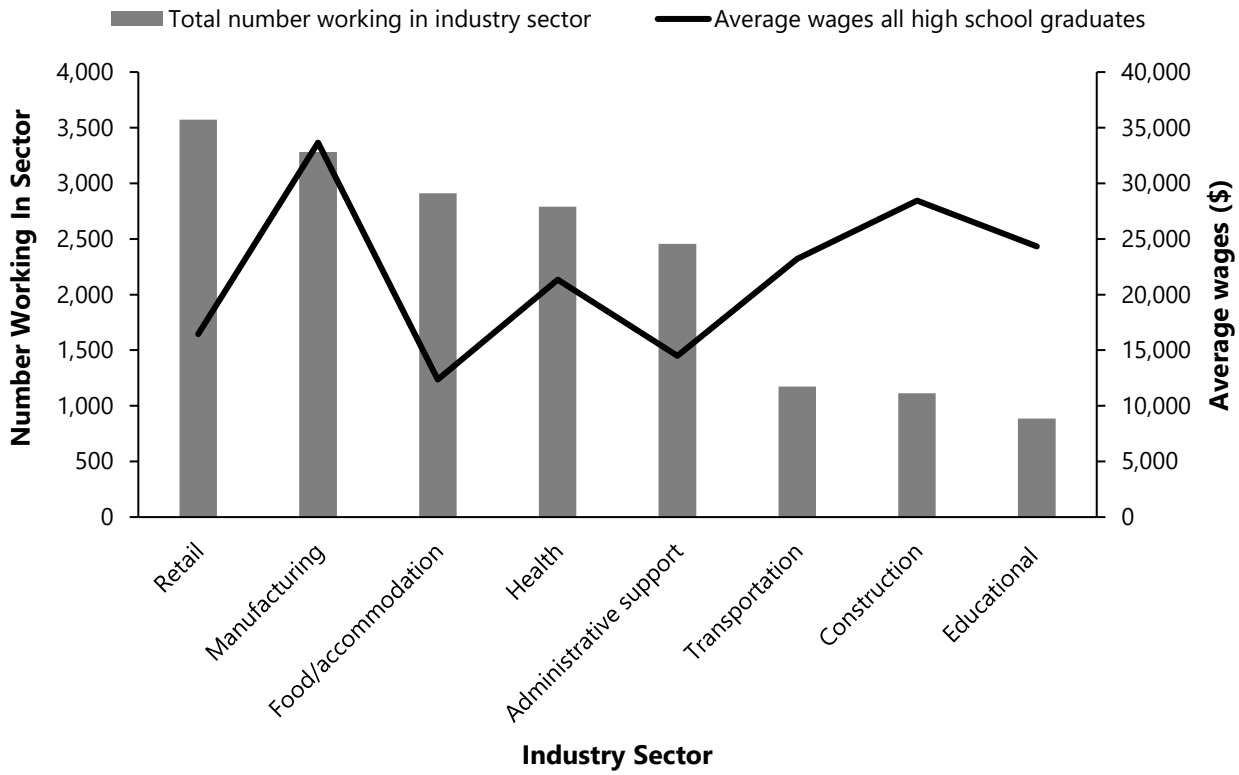
[a] See Appendix H for differences by student group in pathway completion in the program areas in 2018.

The relationship between program area and sector of employment is shown in Appendix K and is summarized in some program areas later in this chapter.

Wages for all graduates (regardless of CTE completion and education level) are highest in the manufacturing sector. Wages in the construction and transportation sectors are also relatively high, but these sectors employ fewer workers.

Figure 3.B shows that wages are highest in the manufacturing sector, which is also the sector with the second-highest number of 2013 graduates working. Wages and employment in the manufacturing sector explain much of the difference in wages between CTE completers and noncompleters because of the higher percentage of CTE completers versus noncompleters employed in the manufacturing sector. While wages in the construction sector and, to a lesser extent, the transportation sector are also relatively high, those sectors employ far fewer workers. Two of the three sectors with the largest number of workers—retail and food/accommodations—have the lowest wages.

Figure 3.B
Number Of 2013 Graduates Employed And Average Wages By Industry Sector
2018



Note: Industry sectors include wages for a variety of specific occupations associated with jobs in those industries, not all of which are directly related to that industry; for example, the health sector includes not only health workers but drivers, cooks, and maintenance workers in hospitals. The figure includes only those graduates who were not enrolled in postsecondary education at any point in the 2018 school year. The figure does not include relatively small industry sectors such as public administration, finance, or professional services.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Female graduates are employed in the manufacturing, transportation, and construction sectors at lower rates than male graduates and are employed in the health sector at higher rates.

Appendix L shows gender-associated differences in employment by sector. The percentages of females employed in the highest-wage sectors are low, at 24 percent for manufacturing, 28 percent for transportation, and 7 percent for construction. Females are more likely than males to be employed in health (86 percent) and education (71 percent).

Appendix M shows the average wages by industry sector and education level of 2013 graduates working in 2018. With the exception of retail and food/accommodations, average salary increases substantially with education level.

Wages By Postsecondary Attainment And CTE Completion

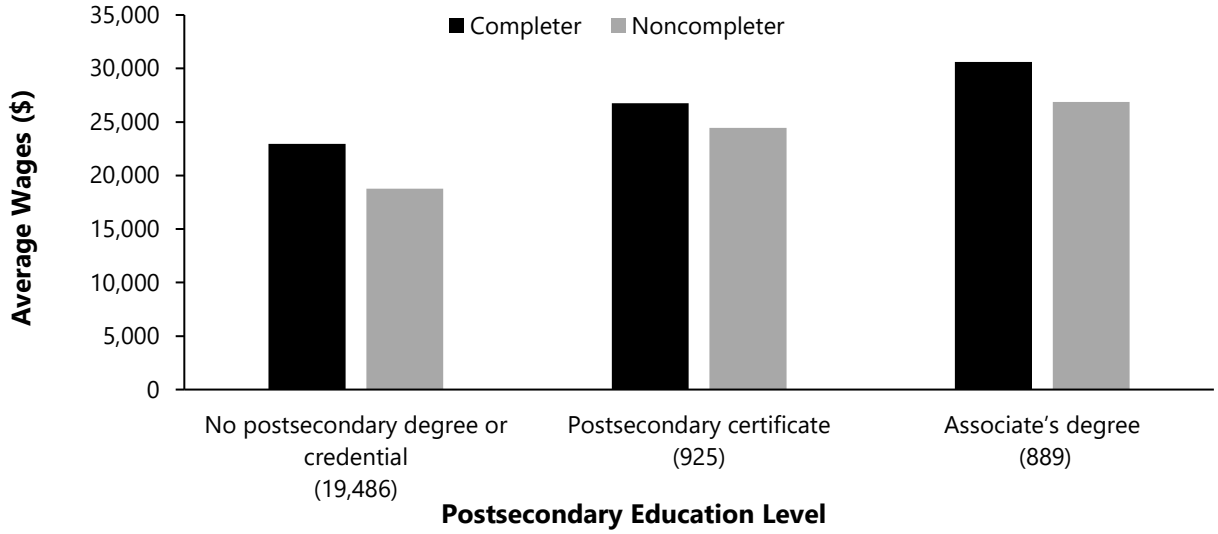
Figure 3.C shows average wages of 2013 graduates working in 2018 by education level and CTE completion. As with all of the wage calculations in this report, graduates who were enrolled in a postsecondary institution at any time during the academic year corresponding with the fiscal year analyzed were not included in the analysis.

On average, CTE pathway completers earned more than noncompleters. CTE wage premiums were greatest for graduates who did not earn a postsecondary degree or credential.

On average, CTE completers earned more than noncompleters at every level, but wage premiums were greater for those with no postsecondary credential or degree than for those with higher levels of education. High school graduates in 2013 who were working in 2018 with no postsecondary degree or credential earned an average of approximately $23,000 compared with approximately $19,000 for graduates who did not complete pathways—a CTE-associated wage premium of 22 percent. In comparison, CTE-associated wage premiums were 9 percent for those with postsecondary certificates or diplomas and 14 percent for those with associate's degrees.

Because graduates with no postsecondary degree or credential constitute the majority of the workers in the graduating class of 2013 and Kentucky's workforce in general, this chapter focuses largely on that group.

Figure 3.C
Average Wages of 2013 Graduates
By CTE Completion Status And Postsecondary Education Level
FY 2018



Note: Wages for bachelor's degrees are not reported, as most workers had recently graduated.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Wages By CTE Program Area

No Postsecondary Degree Or Credential

Figure 3.D shows the average wages of 2013 graduates working in 2018 with no postsecondary degree or credential, by CTE program area. As noted earlier and shown in Appendix K, a minority of the CTE completers in each program area go on to work in the sector most closely associated with their program areas. The figure does not show all program areas. Appendix N shows 2018 wage data for graduates in all program areas.

Of the HWHD program areas, wages for completers in manufacturing, transportation, and construction were greatest.

The figure shows that, of the HWHD programs, wages for CTE completers in manufacturing ($29,800), transportation ($26,100), and construction ($24,900) were the highest. Wages for completers in these higher-wage pathways were even greater for graduates working in workforce sectors related to their CTE program area. Average wages for manufacturing pathway completers working in the manufacturing sector were $36,200, and average wages for construction pathway completers working in construction were $31,800.

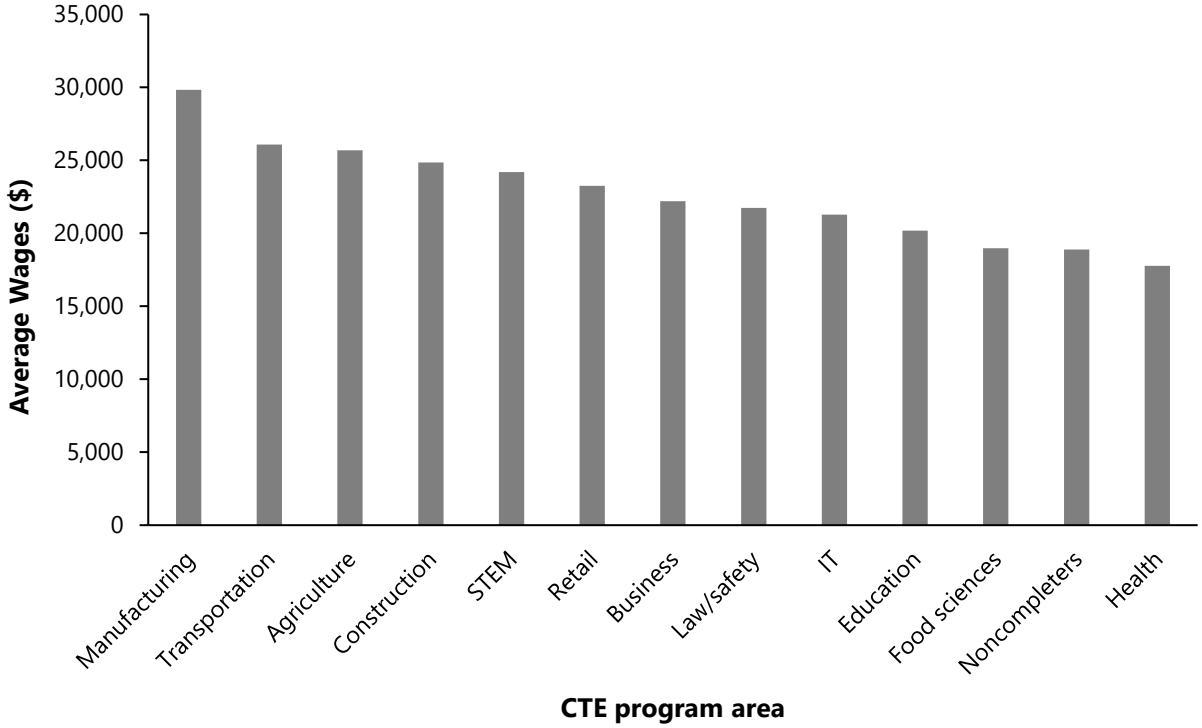
Health pathway completers working without a postsecondary degree or certificate earned, on average, less than noncompleters. Compared to other HWHD program areas, business completers working with no postsecondary education also earned relatively low wages.

The figure also shows that, on average, completers in health pathways earned relatively low wages of $17,800—less than the average wages of CTE noncompleters ($18,900). While health has been identified as a higher-wage sector, most high-wage health jobs require at least an associate's degree. The figure also shows relatively low wages for business program completers working with no postsecondary degree or credential. Approximately two-thirds of health pathway and business pathway completers in 2013 had not earned a postsecondary degree or certificate by 2018.

Wages of agriculture pathway completers with no postsecondary education were comparable to those of CTE completers in the highest-wage program areas.

Agriculture has not been identified as a higher-wage sector, but, as shown in the figure, average wages of agriculture completers ($25,700) were comparable to wages of construction and transportation pathway completers.

Figure 3.D
Average Wages Of 2013 CTE Completers With No Postsecondary Degree Or Credential By Program
2018



Note: STEM = science, technology, engineering and math; IT = information technology; CTE = career and technical education. This figure separates the human services program area into pathways related to education (such as early child education and fundamentals of teaching) and those related to food (such as culinary and food services).
Source: Staff analysis of data from the Kentucky Center for Statistics.

Many of the skills acquired by agriculture pathway completers may be transferable to other sectors. Some agriculture pathways include coursework on construction, equipment, and operation of machines.

Agriculture Pathways. Given lack of demand for agriculture workers, the higher wages of agriculture pathway completers are surprising and suggest that skills acquired in agriculture pathways may be transferable to other sectors.[b] As one example, the Agricultural Power, Structural, Technical Systems pathway within the agriculture program area includes coursework on construction, equipment, and operation of machines. Appendix O shows that, of all pathway completers working in 2018, completers in the Agricultural Power, Structural, Technical Systems pathway were among the highest wage earners.

Agriculture pathway completers may be prepared for the workforce through their participation in student organizations and work-based learning.

It is also possible that agriculture pathway completers are prepared for the workforce through their participation in student organizations or related work-based learning over the summer. KRS 157.360(12)(a) requires that agriculture teachers work 12 months out of the year in order to supervise work-based learning opportunities for agriculture students and their participation in student organizations.

A minority of program completers worked in the industry sector most closely aligned with their program area.

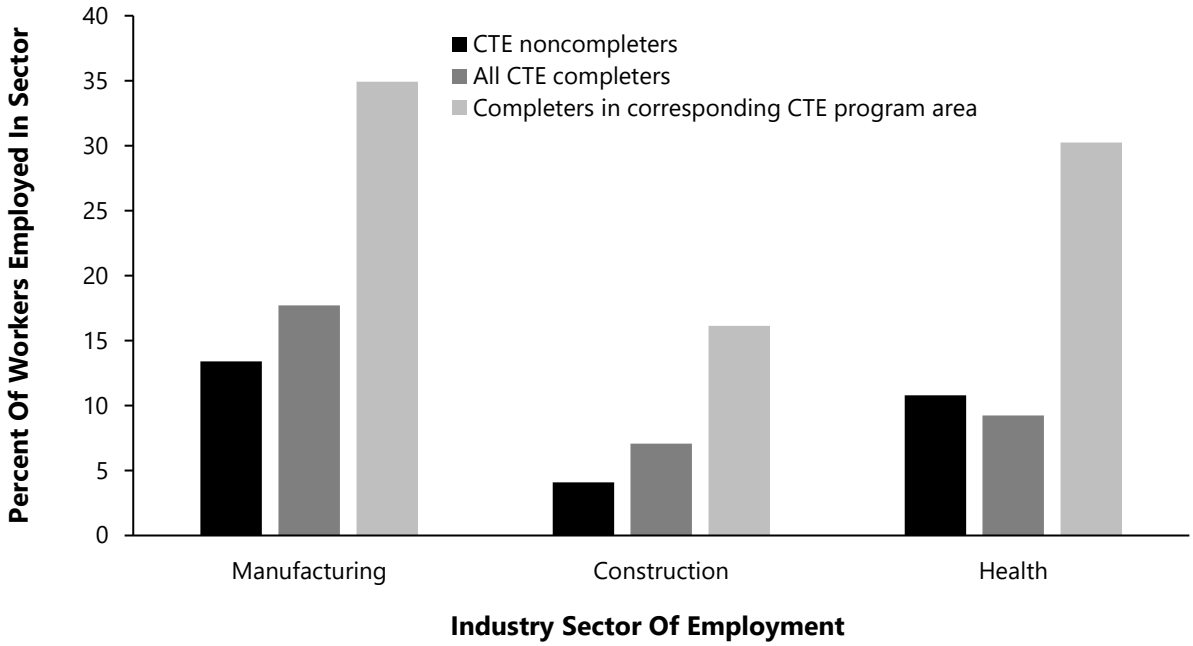
As explained earlier, a minority of program completers worked in the industry sector most closely aligned with their program area. For example, of the manufacturing program completers working with no postsecondary degree or credential, only approximately one-third were working in the manufacturing sector. Appendix K shows sectors of employment in 2018 by program area of 2013 graduates.

Manufacturing, construction, and health completers were more likely than other graduates to be working in the industry sector related to their program areas.

Figure 3.E highlights employment trends in three of the HWHD industry sectors, showing differences in the percentage of completers and noncompleters who were working in 2018 and employed in each sector. It also shows, as a subset of all CTE completers, the percentage of completers in the aligned program area who were employed in that sector. Fourteen percent of noncompleters were working in the manufacturing sector, compared to 18 percent of completers and 35 percent of manufacturing program completers. Thus, manufacturing program completers were two-and-a-half times as likely to be working in the manufacturing sector as were noncompleters. Construction pathway completers were 4 times as likely to be working in the construction sector as CTE noncompleters (16 percent versus 4 percent), and health completers were 2.8 times as likely to be working in the health sector as CTE noncompleters (30 percent versus 11 percent).

[b] As shown in Appendix K, agriculture pathway completers working in the manufacturing and construction sectors specifically earn, on average, as much as or more than manufacturing and construction completers.

Figure 3.E
Percentage Of 2013 Graduates Working With No Postsecondary Degree Or Credential In The Manufacturing, Construction, And Health Sectors, By CTE Completion
2018



Note: CTE = career and technical education.
Source: Staff analysis of data from the Kentucky Center for Statistics.

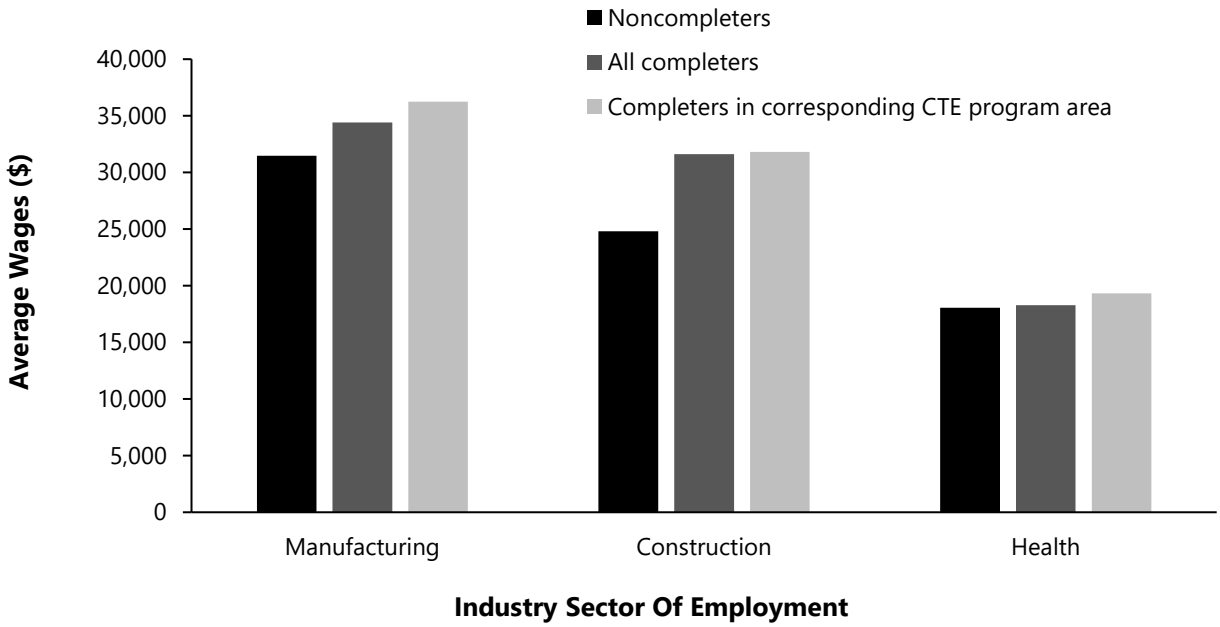
CTE program-specific wage premiums in the construction and manufacturing sectors were far greater than those in the health sector.

Figure 3.F shows average wages of 2013 graduates working in the same sectors by CTE completion and sector-specific CTE completion. The figure shows that while all graduates in the manufacturing sector earned higher wages, CTE completers earned more than noncompleters ($34,400 and $31,500, respectively) and manufacturing completers earned even more—$36,300, or 15 percent more than noncompleters. In the construction sector, construction pathway completers earned 28 percent more than CTE noncompleters, but not much more than other CTE completers. This may be because of the high wages of manufacturing and agriculture program completers who were working in the construction sector.[c] CTE wage premiums for health program completers working in the health sector were relatively small; health program completers earned an additional 7 percent over CTE noncompleters ($19,300 and $18,000).[d]

[c] Manufacturing completers working in the construction sector earned approximately the same wages as construction completers, but agriculture pathway completers earned an average of over $34,000—greater than construction completers.

[d] The CTE wage premium for health program completers working in the health sector is greater in the years immediately following graduation, but fades over time for those who do not go on to earn postsecondary credentials or degrees.

Figure 3.F
Average Wages Of 2013 Graduates Working With No Postsecondary Degree Or Credential In the Manufacturing, Construction, And Health Sectors, By CTE Completion
2018



Note: CTE = career and technical education.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Wages By Program Area And Postsecondary Credential Or Degree

Average wages are greater for all graduates with attainment of postsecondary credentials or degrees. Wages of manufacturing program completers remain highest even for graduates with associate's degrees or above.

Figure 3.G compares, by CTE program area, average wages of pathway-completing graduates with no postsecondary degree or credential with those of pathway-completing graduates who attain postsecondary certificates or degrees of associate or higher. The figure shows substantial wage increases in some program areas as graduates earn postsecondary certificates. Increases are especially great for pathway completers in transportation, construction, and law/safety.[e] Average wages of manufacturing and construction pathway completers also increase substantially with attainment of

Health pathway completers who graduated in 2017 made an average of $10,256 in the health sector, an additional 23 percent over the $8,278 made by CTE noncompleters.

[e] Two-thirds of the postsecondary certificates earned by transportation completers and almost one-half of those earned by architecture and construction program completers were in mechanic repair technology technician. Only 1 of the 22 certificates earned by law/safety program graduates was in a field related to law or safety. Academic areas varied, but liberal arts certificates were the most common.

associate's degrees or higher. The majority earned associate's degrees in technical field.[f] Five years after graduation, wages of manufacturing pathway completers remain highest even for graduates with associate's degrees or above.

Average wages of health pathway completers surpass those of noncompleters only with attainment of an associate's degree or above.

Average wages of health pathway completers increased with postsecondary certificates but are notably still lower than those of graduates who did not complete CTE programs. While Kentucky Future Skills Report demand data indicate that approximately one-third of health jobs are in this middle skill category, the entry wages for nursing assistants, which are the largest occupation group in that category, are relatively low. Average wages of health pathway completers surpass those of noncompleters only with the attainment of an associate's degree.[g] By 2013, 11 percent of health completers had earned an associate's degree, and 12 percent had earned a bachelor's degree. Of the health degree completers who earned an associate's degree or above, 57 percent did so in a health-related field.

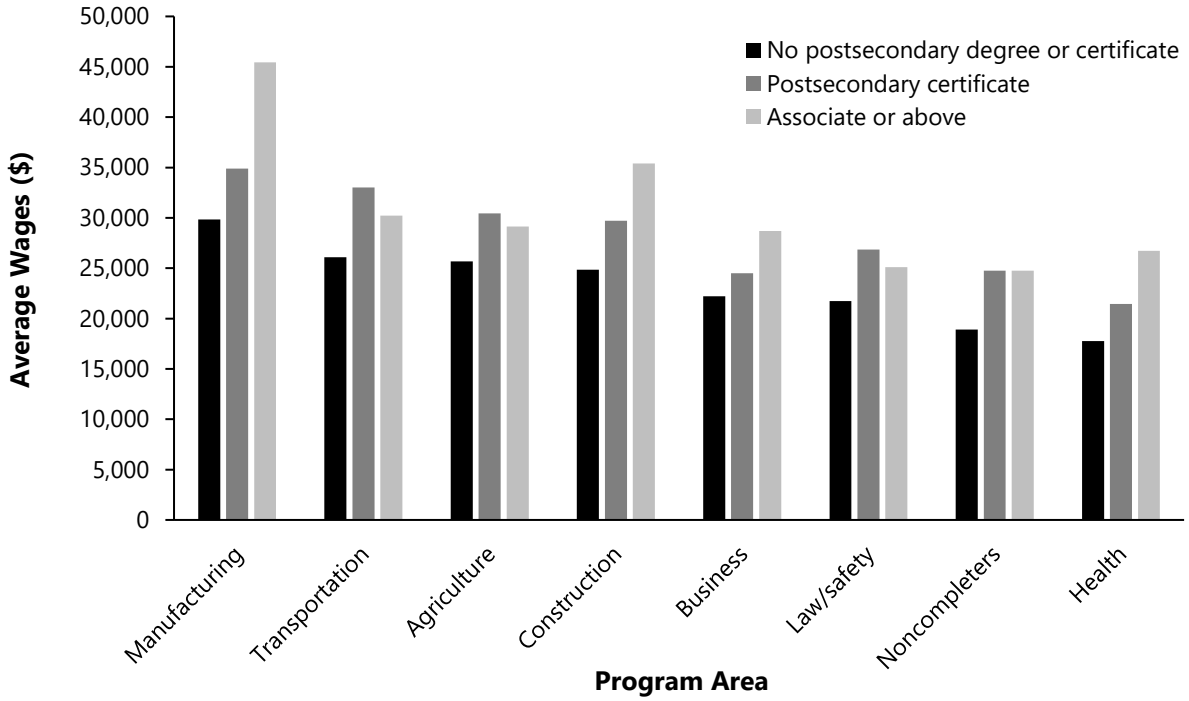
Postsecondary institutions are facing challenges associated with increasing enrollment slots in health fields. These include lack of qualified clinical instructors and faculty; low availability of clinical rotation sites; and costs associated with increasing the number of students.

Understanding the comprehensive barriers to degree attainment for health pathway completers is beyond the scope of this report. It is worth noting, however, that postsecondary institutions may not currently be equipped to expand enrollment slots in health programs to meet the demand for those slots. Their challenges include lack of qualified clinical instructors and faculty; low availability of clinical rotation sites; and costs associated with increasing the number of students. [9]

[f] Of the construction pathway completers earning associate's degrees, approximately one-third did so in mechanic repair technology and another third in technical fields. The higher wages from these associate's degree earners were in the manufacturing sector. Of the manufacturing sector associate's degree earners, approximately two-thirds were in technical fields, including precision production, mechanic repair technology, and construction, and highest wages came from those working in the manufacturing sector.

[g] The figure shows wages of all health pathway completers who earned associate's degrees. Of those, approximately two-thirds did so in health fields, and most were employed in the health industry in 2018. The 50 health pathway completers who earned an associate's degree in health earned, on average, approximately $33,000 in 2018.

Figure 3.G
Average Wages Of 2013 CTE Graduates By Level of Education And Program
2018



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

CTE health pathway completers earn health-related degrees or credentials at higher rates than other graduates, but average wages after obtaining those degrees are not higher for high school health pathway completers than noncompleters.

Appendix P contains data showing postsecondary education trajectories and wages of completers in the health program areas. It shows that CTE health pathway completers earn degrees or credentials in health fields at higher rates than other graduates, but the average wages of health pathway completers after obtaining those degrees were not higher than those of graduates who obtained postsecondary health degrees but did not complete a health pathway in high school.

Absent aggressive efforts to increase the percentage of health completers earning postsecondary degrees, CTE health pathways will not likely lead to higher wages for most graduates.

The data in this report suggest that, absent aggressive efforts to increase the percentage of health completers earing postsecondary degrees, CTE health pathway completion in high school will not likely lead to higher wages for most graduates. This is not to say that students should be discouraged from enrolling in health pathways. As evidenced by the data and as reported on the OEA survey and by principals during site visits, health pathways are popular with students. Also, as shown above, health pathway completers working in the health sector earn slightly higher wages than noncompleters. However, educators and policy makers should be aware that, compared to pathway completers in most other program areas (including those not considered HWHD), most health pathway completers are not employed in high-wage jobs.

Workforce Participation And Wages Of 2017 Graduates By Additional CTE Indicators

Industry Certificates And State-Developed End-Of-Program Exams

Beginning in the 2020 school year, graduates will be considered transition ready in Kentucky's accountability system if they earn an industry certificate or pass a state-developed end-of-program assessment, whether or not they complete a career pathway.

CTE completers from the class of 2017 earned an average of almost 30 percent more than noncompleters in the year after graduation and were employed at higher rates.

Table 3.1 shows average 2018 wages for pathway completers and noncompleters for the 2017 graduating class, with or without earning an industry certificate or passing a state-developed assessment, previously known as the KOSSA. The table shows generally that CTE completers earned more than noncompleters ($12,036 versus $9,305, an additional 29 percent) and also had higher rates of workforce participation (76 percent versus 70 percent).[h] Appendix Q shows regional variation in CTE premiums and workforce participation rates.

CTE completers who earned an industry certificate or passed a Kentucky Occupational Skill Standards Assessment exam earned an average of 12 percent more than completers who did not.

In addition, the table shows that pathway completers who earned an industry certificate or passed a KOSSA earned, on average $12,521, or 12 percent more than pathway completers who did not pass those performance-based measures ($11,161). Wages for pathway noncompleters who earned a certificate or passed a KOSSA were $10,867, versus $9,030 for noncompleters who did not pass these measures, a premium of 20 percent.

The table also shows that CTE pathway completers earned more than noncompleters regardless of whether a certificate was earned or a KOSSA was passed. For example, a noncompleter who earned a certificate or passed a KOSSA earned an average of $10,867, still lower than the $11,161 earned by program completers who did not complete a certificate. Appendix R shows the industry certificates associated with highest wages for 2017 graduates in 2018. In that year, the National Institute for Metalworking Skills Machine Tool Certification (Level 1) certificate earned by pathway completers appeared to have the greatest market value. Completers who earned this certificate earned an average of $22,400, more than double the average wage of 2017 graduates in 2018.

[h] Actual workforce participation is likely higher for both groups, as UI data does not contain data for the self-employed, military, or federal workers.

Table 3.1
Wages Of 2017 Graduates By CTE Completion And Industry Certificate Or KOSSA
2018

CTE Completion Status	Total Graduates Not Enrolled	Percent Working 2018	Average Wages
All CTE completers	6,792	76%	$12,036
With industry certificate or KOSSA	4,350	77	12,521
Without industry certificate or KOSSA	2,442	76	11,161
All noncompleters	15,034	70	9,305
With industry certificate or KOSSA	2,084	75	10,867
Without industry certificate or KOSSA	12,950	69	9,030

Note: CTE = career and technical education; KOSSA = Kentucky Occupational Skill Standards Assessment.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Kentucky's accountability system no longer requires students to complete a minimum number of courses within a pathway to be recognized in the accountability system. There is a possibility that this change will have the unintended consequences of causing some schools to reduce course offerings within individual pathways.

Data shown in Table 3.1 indicate that, historically, graduates who completed pathways and earned an industry certificate or passed a KOSSA earned more than those who passed the performance-based measures but did not complete a pathway. As noted in Chapter 1, Kentucky's revised accountability system does not require students to complete courses with a pathway in order to be considered transition ready. There is a possibility that this change will have the unintended consequence of causing some schools to offer the minimum number of courses that they believe is necessary to prepare students to pass the certification tests, rather than the full four-course sequence necessary to complete a pathway. During site visits made in connection with this study, staff did learn of a possible strategy that included planning coursework and personnel hires around industry certificates rather than career pathways.

Cooperative Education Classes

CTE completers who also earned a cooperative work credit during high school earned an average of over 20 percent more than completers who did not.

Appendix S shows that average wages were higher for CTE completers and noncompleters who earned cooperative work credits under supervised employment prior to high school graduation than for those who did not complete co-op classes. CTE pathway completers who also participated in cooperative education classes earned over 20 percent more than pathway completers who did not participate.

Dual-Credit And Postsecondary Enrollment

CTE completers earned dual credits at higher rates than noncompleters. CTE completers who earned dual credits enrolled in postsecondary education at higher rates than CTE completers who did not.

Chapter 2 shows that CTE completers earned a grade of C or above in a dual-credit class at higher rates than noncompleters. Appendix S shows that, depending on GPA, CTE completers who earned dual credits enrolled in college at rates of between 15 percent and 30 percent higher than completers who did not earn dual credits.

Demographic Differences In CTE Outcomes

While CTE completion is associated with higher wages for both male and female graduates, the wage premiums associated with gender are greater than those associated with CTE completion.

Table 3.2 shows gender-associated differences in wages for 2013 graduates working in 2015 and 2018 without a postsecondary credential or degree. CTE wage premiums were greater for male completers than for female completers. For example, 2 years after graduation, male completers from the class of 2013 made 30 percent more than male noncompleters, whereas female completers made only 9 percent more than female noncompleters. While CTE completion is associated with higher wages for both male and female graduates, the wage premiums associated with gender are greater than those associated with CTE completion. Average wages of $16,089 for male completers in 2015 were 58 percent higher than the average wages of $10,138 for female completers.

Table 3.2
Average Wages of 2013 Graduates By Gender And High School CTE Completion
2015 And 2018

		Average Wages		
Fiscal Year Of Employment	Gender	Completers	Noncompleters	CTE Premium
2015	Female	$10,138	$9,265	9%
	Male	16,089	12,381	30
2018	Female	17,305	16,386	6
	Male	27,048	21,555	25

Note: CTE = career and technical education.
Source: Staff analysis of data from the Kentucky Center for Statistics.

As shown in Appendix H, male graduates are more likely than female graduates to work in the higher-wage employment sectors of manufacturing, construction, and transportation. Females are more likely than males to work in the lower-wage sectors of food/accommodation and retail. These trends do not entirely explain the gender-associated CTE wage gaps, however, as female graduates make less than male graduates in every sector.

CTE wage premiums are greater for pathway completers not eligible for FRPL than for FRPL-eligible completers and are greater for white than for black or Hispanic completers.

Appendix T contains additional demographic wage data showing that CTE wage premiums are, on average, greater for completers not eligible for FRPL than for those eligible, and greater for white completers than for black or Hispanic completers. CTE wage premiums for completers with an IEP are similar to those for completers without an IEP.

It is unclear from the data how much of the differences in CTE wage premiums reflect part- versus full-time employment.

It is unclear from the data how much of the demographic differences in CTE wage premiums might be associated with differences in full- versus part-time work. Wage data available do not distinguish between full- and part-time employees.

Conclusion

This report provides data supporting existing calls to expand access in highest-demand areas of manufacturing, transportation, and construction. In addition, the report reinforces the importance of connecting CTE in high school with continuing opportunities for postsecondary education. It highlights, in particular, the need to increase the number of health pathway completers earning degrees of associate or above. The report also suggests that ongoing and periodic analysis of postsecondary outcomes would be helpful to ensure that the intent of CTE and other policy initiatives is borne out by data.

Expanding Access To Higher-Wage Pathways Among Districts And Student Groups

Data in the report support existing calls to expand access to highest-demand pathways in manufacturing, transportation, and construction. Supply of completers is not meeting demand in all three program areas. Demand is greatest for manufacturing completers.

Higher Wages In Manufacturing Construction And Transportation. Data on the employment outcomes of CTE completers in HWHD program areas show highest wages for graduates who complete manufacturing pathways, followed by transportation and construction completers. Supply of completers in these higher-wage program areas is not meeting demand, and demand for manufacturing completers is greatest.

In 2018, more than one-third of districts in the commonwealth had few or no graduates completing manufacturing pathways. Manufacturing pathway completion rates are greater in districts with students attending ATCs than in those that provide CTE in LAVECs or comprehensive high schools.

Different Rates Of Manufacturing Pathway Completion By District. In 2018, in more than one-third of districts in the commonwealth (including Jefferson and Fayette Counties), less than 1 percent of graduates completed manufacturing pathways. Variation among districts in the percentage of graduates completing manufacturing pathways is associated with the CTE school types. Districts sending students to ATCs generally have higher rates than those sending students to LAVECs. Districts that provide CTE only in comprehensive high schools have the lowest rates.

Costs associated with beginning and maintaining pathways are higher in highest-wage program areas. CTE funding is not adjusted for district wealth.

Greater State CTE Funding For ATC Versus LAVEC Districts. Unlike state SEEK funding, current methods for funding CTE are not adjusted for district wealth. Costs associated with beginning and maintaining pathways are generally higher in the highest-wage program areas than in other program areas. ATCs receive approximately 5 times as much state per-pupil funding per year as LAVECs.[10] Districts operating LAVECs fund CTE pathways largely out of their general fund budgets. Some of the districts operating LAVECs are among the lowest-wealth districts in the state.

Rural or remote districts must often pay more to transport students. Districts are reimbursed for approximately one-third of transportation costs.

Transportation Costs. Increasing access to highest-wage pathways may rely on an increasingly regional approach to CTE delivery and will require students to be transported. Because districts are being reimbursed for only approximately one-third of the costs of transporting CTE students, districts with higher transportation costs are at a relative disadvantage. Rural or remote districts must often pay more to transport students. Many of these districts are among the state's lowest-wealth districts.

The percentage of graduates completing manufacturing pathways is much greater for male than for female graduates and for white than for black graduates.

Demographic Differences In Pathway Completion. The report also shows that the percentage of male graduates completing manufacturing pathways (5.2 percent) is 13 times the percentage of female graduates (0.4 percent) completing these pathways. Furthermore, the percentage of white graduates (3.2 percent) completing manufacturing pathways is 4 times the percentage of black graduates doing so (0.8 percent). Relatively low rates of manufacturing pathway completion by black students is explained, in part, by lower manufacturing pathway completion rates in Fayette and Jefferson Counties. It is unclear what explains the lower rates of manufacturing pathway completion by female students. To the extent that perceived student interest is a factor with any underrepresented student group, efforts should be made to inform, engage, and recruit these students into manufacturing pathways.

Local Decision Making

Local leaders express frustration at limitations on pathways that can be offered outside of HWHD areas. This report shows that average wages for completers in some non-HWHD pathways exceed those of health and business pathway completers.

OEA site visit and survey data indicate frustration of local leaders with limitations put on pathways that can be offered based on what is considered HWHD at the state level. Data in the report show that average wages of completers in agriculture pathways are greater than those of health and business pathway completers. Average wage of completers in some other non-HWHD pathways are also greater than those of health pathway completers.[i]

Data in the report also raise the concern that CTE opportunities in some districts are not in line with demand in highest-wage program areas.

Data in this report also raise the concern that CTE opportunities offered to high school students in some districts may not always be in line with workforce demand in highest-wage program areas. This is especially true in the manufacturing program area.

[i] The Agricultural Power, Structural, Technical Systems pathway is currently labeled HWHD for purposes of additional points in the accountability system, but other agriculture pathways are not and may not be approved for ATCs.

Use Of Outcome Data To Evaluate Programs

The report shows that wages for pathway completers in program areas believed to be high wage may not always be what is expected.

This report provides strong evidence of likely positive effects of the state's recent efforts to expand access to pathways in manufacturing, construction, and transportation. It also illustrates that workforce outcomes for CTE graduates in other pathways may not always reflect desired outcomes.

More graduates complete pathways in health than in any other area. Most health completers go on to earn relatively low wages. The General Assembly may wish to periodically review the relationship between CTE enrollment and workforce outcomes.

Relatively Low Wages For Health Pathway Completers. Most graduates in the state's highest-enrolled CTE program area—health —go on to earn relatively low wages. Higher-wage health jobs require at least an associate degree; by 2018, less than one-quarter of health pathway completers had earned a degree of associate or above. The General Assembly may wish to periodically review the relationship between CTE enrollment and workforce outcomes.

The General Assembly may wish to request future studies that track the postsecondary outcomes of graduates who are being considered transition ready in the current accountability system.

In addition, the General Assembly may wish to request future studies that track the postsecondary outcomes of graduates who are being considered transition ready in the current accountability system. The report notes the historically higher wages of graduates who both completed CTE pathways and earned industry certificates or passed KOSSAs. It is possible that, in response to the current policy incentives, some districts might elect to reduce the number of courses offered in individual pathways in favor of increasing the number of classes that might lead to industry certificates in different program areas. It is unknown whether graduates who earn industry certificates or pass state-approved exams without completing pathways can expect the same wage benefits.

Appendix A

Local Workforce Areas

Table A.1 displays Kentucky school districts by local workforce area.

Table A.1
School Districts In Each Local Workforce Area

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

Note: EKCEP = Eastern Kentucky Concentrated Employment Program; TENCO = TENCO Workforce Investment Board.
Source: Kentucky Association for Economic Development.

Appendix B

High School Principal Comments On Benefits Of CTE

OEA's survey of principals in ATCs, LAVECS, and comprehensive high schools included an open-ended comment section. Many principals offered comments on the benefits of CTE beyond preparing students for a specific occupation. These included student engagement, motivation, and productive work habits. Following is a sample of these comments.

"CTE plays an integral part in preparing our students to not only succeed after they graduate but become productive members of the community in which they live."

"CTE has a direct connection between graduation and a good job. CTE keeps students in school and engaged because students grasp the earning power of their learning."

"CTE provides students with programs that not only train them for specific pathways, but also provide general workplace readiness skills that benefit students and employers. Since most CTE staff have backgrounds in business/industry before becoming educators, they are able to transfer knowledge of those workplaces to our students. When a CTE teacher says 'this is what industry is looking for,' they are backing that up with prior work experience."

"CTE courses provide a great deal of life skills that are essential to being productive citizens. These skills include but are not limited to work ethic, consumerism, communication, personal finance, etc."

"Military/JROTC pathways are extremely important to consider adding back to CTE pathways. This pathway 'saves' many of our students who make poor decisions and the curriculum offers rich and rigorous leadership content."

"CTE courses are a vital part of what we do to help prepare students for their futures. For many of our students, it is what drives them to be successful at school."

"We believe strongly that CTE is an avenue that has been overlooked for many years and that it plays a vital part of increasing a student's interest in their academic classes and provides a direction for a possible career after they graduate."

"Students are able to shine and show a strength that may be outside the realm of traditional coursework. This allows students to network and experience the world in a nontraditional way."

Appendix C

Career And Technical Education Access By District

Table C.1 shows how students accessed career and technical education in Kentucky school districts in 2019. Students could access CTE through area technology centers, local area vocational education centers, district-funded CTE centers, or comprehensive high schools. Some districts housed either ATCs or LAVECs, and others sent their students to ATCs or LAVECs, in other districts.

Table C.1
Career And Technical Education Access Category By District
2019

District	ATC	ATC Feeder	LAVEC	LAVEC Feeder	District-Funded CTE Center	Comp. High School Only	N/A
Adair County		✓					
Allen County			✓				
Anchorage Independent							✓
Anderson County		✓					
Ashland Independent						✓	
Augusta Independent		✓					
Ballard County			✓				
Barbourville Independent		✓					
Bardstown Independent		✓					
Barren County	✓						
Bath County		✓	✓				
Beechwood Independent		✓		✓			
Bell County	✓						
Bellevue Independent		✓					
Berea Independent		✓					
Boone County	✓				✓		
Bourbon County		✓					
Bowling Green Independent		✓	✓				
Boyd County			✓				
Boyle County		✓					
Bracken County		✓					
Breathitt County	✓						
Breckinridge County	✓						
Bullitt County	✓						
Burgin Independent		✓					
Butler County	✓						
Caldwell County	✓						
Calloway County		✓					
Campbell County	✓						
Campbellsville Independent		✓					
Carlisle County		✓					
Carroll County	✓						

District	ATC	ATC Feeder	LAVEC	LAVEC Feeder	District-Funded CTE Center	Comp. High School Only	N/A
Carter County			✓				
Casey County	✓						
Caverna Independent		✓					
Christian County			✓				
Clark County	✓						
Clay County	✓						
Clinton County	✓						
Cloverport Independent		✓					
Corbin Independent	✓						
Covington Independent			✓				
Crittenden County		✓					
Cumberland County		✓					
Danville Independent		✓					
Daviess County						✓	
Dawson Springs Independent		✓					
Dayton Independent		✓					
East Bernstadt Independent							✓
Edmonson County		✓	✓				
Elizabethtown Independent						✓	
Elliott County		✓					
Eminence Independent		✓					
Erlanger-Elsmere Independent		✓					
Estill County		✓					
Fairview Independent		✓					
Fayette County			✓				
Fleming County			✓				
Floyd County	✓						
Fort Thomas Independent		✓					
Frankfort Independent						✓	
Franklin County			✓				
Fulton County	✓						
Fulton Independent		✓					
Gallatin County		✓					
Garrard County	✓						
Glasgow Independent		✓					
Grant County			✓				
Graves County		✓					
Grayson County			✓				
Green County	✓						
Greenup County	✓						
Hancock County		✓					
Hardin County					✓		
Harlan County		✓					
Harlan Independent		✓					
Harrison County	✓						
Hart County		✓					
Hazard Independent						✓	
Henderson County			✓				

District	ATC	ATC Feeder	LAVEC	LAVEC Feeder	District-Funded CTE Center	Comp. High School Only	N/A
Henry County		✓					
Hickman County		✓					
Hopkins County					✓		
Jackson County	✓						
Jackson Independent		✓					
Jefferson County			✓				
Jenkins Independent		✓					
Jessamine County			✓	✓			
Johnson County			✓				
Kenton County			✓				
Knott County	✓						
Knox County	✓						
LaRue County						✓	
Laurel County					✓		
Lawrence County			✓				
Lee County	✓						
Leslie County	✓						
Letcher County	✓						
Lewis County			✓				
Lincoln County	✓						
Livingston County		✓	✓				
Logan County	✓						
Ludlow Independent							
Lyon County		✓					
Madison County	✓						
Magoffin County			✓				
Marion County	✓						
Marshall County			✓				
Martin County	✓						
Mason County	✓						
Mayfield Independent	✓						
McCracken County		✓					
McCreary County			✓				
McLean County						✓	
Meade County	✓						
Menifee County		✓					
Mercer County	✓						
Metcalfe County		✓					
Middlesboro Independent		✓					
Monroe County	✓						
Montgomery County	✓						
Morgan County	✓						
Muhlenberg County			✓				
Murray Independent	✓						
Nelson County	✓						
Newport Independent			✓				
Nicholas County		✓					
Ohio County	✓						
Oldham County					✓		
Owen County		✓					

District	ATC	ATC Feeder	LAVEC	LAVEC Feeder	District-Funded CTE Center	Comp. High School Only	N/A
Owensboro Independent					✓		
Owsley County		✓					
Paducah Independent	✓						
Paintsville Independent						✓	
Paris Independent		✓					
Pendleton County		✓					
Perry County						✓	
Pike County	✓						
Pikeville Independent		✓					
Pineville Independent		✓					
Powell County			✓				
Pulaski County	✓						
Raceland-Worthington Independent		✓					
Robertson County		✓					
Rockcastle County	✓						
Rowan County		✓					
Russell County	✓						
Russell Independent	✓						
Russellville Independent		✓					
Science Hill Independent							✓
Scott County			✓	✓			
Shelby County	✓						
Silver Grove Independent		✓					
Simpson County			✓				
Somerset Independent		✓					
Southgate Independent							✓
Spencer County		✓			✓		
Taylor County		✓			✓		
Todd County		✓					
Trigg County		✓	✓				
Trimble County		✓					
Union County			✓				
Walton-Verona Independent		✓					
Warren County	✓						
Washington County		✓					
Wayne County	✓						
Webster County	✓						
West Point Independent							✓
Whitley County		✓					
Williamsburg Independent		✓					
Williamstown Independent						✓	
Wolfe County		✓					
Woodford County				✓			
Total	52	72	32	4	8	10	5

Note: N/A = K-8 district. There are a total of 53 ATCs in 52 districts. Pike County has two ATCs. There are a total of 42 LAVECs in 32 districts.
Source: Kentucky Department of Education.

Appendix D

Per-Pupil Property Assessments By CTE Delivery Type

Tables D.1, D.2, D.3, D.4, and D.5 show district per-pupil property assessments by student access to various types of career and technical education schools as described in Appendix C.

Table D.1
Per-Pupil Property Assessment, LAVECs
2018

LAVEC	Per-Pupil Property Assessment
Magoffin County	$198,599
McCreary County	211,855
Carter County	266,077
Johnson County	278,026
Bath County	281,605
Powell County	286,015
Lewis County	293,874
Fleming County	354,429
Grant County	364,461
Allen County	368,355
Grayson County	368,962
Lawrence County	387,769
Muhlenberg County	390,693
Edmonson County	396,255
Bowling Green Independent	409,816
Henderson County	467,311
Covington Independent	481,907
Union County	505,034
Christian County	511,355
Ballard County	535,925
Simpson County	539,897
Boyd County	545,226
Trigg County	567,028
Marshall County	575,271
Newport Independent	581,575
Scott County	594,046
Jessamine County	601,477
Franklin County	633,846
Kenton County	687,786
Fayette County	850,392
Jefferson County	856,184
Livingston County	890,610
Average	477,552

Source: Kentucky Department of Education.

Table D.2
Per-Pupil Property Assessment, ATC-Operating Districts
2018

ATC-Operating District	Per-Pupil Property Assessment
Clay County	$197,703
Corbin Independent	204,245
Jackson County	218,594
Mayfield Independent	221,684
Bell County	227,161
Morgan County	233,640
Rockcastle County	235,359
Breathitt County	242,652
Butler County	260,063
Letcher County	264,596
Martin County	275,389
Leslie County	280,989
Knox County	283,637
Monroe County	291,496
Pike County	304,252
Ohio County	307,526
Green County	321,247
Knott County	322,217
Clinton County	322,804
Casey County	323,012
Wayne County	326,463
Lincoln County	327,965
Lee County	360,129
Caldwell County	363,124
Floyd County	363,200
Meade County	366,204
Murray Independent	367,945
Greenup County	367,947
Montgomery County	372,620
Webster County	373,168
Barren County	374,204
Garrard County	382,137
Russell Independent	408,359
Harrison County	408,570
Russell County	414,430
Logan County	421,797
Carroll County	454,582
Pulaski County	461,989
Marion County	467,804
Fulton County	470,856
Breckinridge County	483,260
Paducah Independent	501,468
Madison County	511,668
Mercer County	539,842
Bullitt County	541,126
Mason County	567,460
Warren County	607,559
Clark County	623,220

ATC-Operating District	Per-Pupil Property Assessment
Nelson County	626,112
Shelby County	629,765
Boone County	745,815
Campbell County	849,301
Average	392,661

Source: Kentucky Department of Education.

Table D.3
Per-Pupil Property Assessment, ATC Feeder Districts
2018

District	Per-Pupil Property Assessment
Cloverport Independent	$116,196
Dawson Springs Independent	121,569
Jackson Independent	134,196
Pineville Independent	142,185
Barbourville Independent	170,884
Eminence Independent	195,450
Harlan Independent	197,680
Owsley County	204,065
Augusta Independent	205,548
Menifee County	206,133
Jenkins Independent	208,947
Elliott County	214,800
Raceland-Worthington Independent	214,923
Wolfe County	215,085
Whitley County	228,865
Berea Independent	243,880
Williamsburg Independent	248,237
Dayton Independent	252,314
Estill County	263,575
Fairview Independent	269,263
Harlan County	269,791
Robertson County	287,264
Fulton Independent	294,632
Nicholas County	315,950
Metcalfe County	320,338
Russellville Independent	325,274
Adair County	337,190
Hart County	353,757
Pendleton County	358,704
Todd County	366,139
Glasgow Independent	371,632
Henry County	387,891
Walton-Verona Independent	398,142
Paris Independent	402,547
Crittenden County	406,519
Gallatin County	413,632
Carlisle County	425,152
Owen County	430,802
Middlesboro Independent	437,392
Erlanger-Elsmere Independent	440,375
Bracken County	444,470
Washington County	444,470
Cumberland County	445,180
Campbellsville Independent	447,491
Graves County	461,363
Fort Thomas Independent	467,855
Rowan County	474,897
Bourbon County	487,267

District	Per-Pupil Property Assessment
Boyle County	511,574
Somerset Independent	521,378
Anderson County	527,227
Hickman County	531,904
Trimble County	533,981
Danville Independent	552,646
Hancock County	562,545
Burgin Independent	563,032
Bardstown Independent	568,225
Pikeville Independent	582,335
McCracken County	617,408
Caverna Independent	618,579
Bellevue Independent	648,869
Silver Grove Independent	699,549
Calloway County	699,779
Lyon County	959,825
Average	387,012

Source: Kentucky Department of Education.

Table D.4
Per-Pupil Property Assessment, District-Funded CTE Centers
2018

District	Per-Pupil Property Assessment
Owensboro Independent	$349,399
Laurel County	400,719
Hopkins County	457,961
Hardin County	509,892
Oldham County	574,064
Average	458,407

Source: Kentucky Department of Education.

Table D.5
Per-Pupil Property Assessment, Comprehensive High Schools Only
2018

District	Per-Pupil Property Assessment
Williamstown Independent	$230,609
Hazard Independent	263,937
Frankfort Independent	333,914
Elizabethtown Independent	338,474
Perry County	346,617
LaRue County	354,196
Ashland Independent	372,684
Paintsville Independent	374,031
McLean County	399,136
Daviess County	553,703
Average	3,567,301

Source: Kentucky Department of Education.

Appendix E

Percentage Of Projected Jobs By Local Workforce Area And Graduates Completing CTE Pathways

Table E.1
Percentage Of Projected Jobs By Major Occupation Group And Local Workforce Area
2018-2022

Local Workforce Area	Total Jobs	Production	Construction	Installation And Repair	Health	Education	Administrative Support	Sales	Food Preparation And Related
Bluegrass	61,980	9%	3%	4%	9%	7%	11%	10%	11%
Cumberlands	18,912	14	2	4	15	5	11	9	10
EKCEP	16,844	3	4	4	15	6	14	13	11
Green River	14,042	14	4	6	11	4	12	10	10
Kentuckiana Works	87,546	9	4	5	13	3	12	10	10
Lincoln Trail	14,842	14	4	6	7	4	12	11	11
Northern Kentucky	35,098	9	3	4	10	4	12	10	11
South Central	19,292	13	3	5	11	5	12	11	11
TENCO	11,444	9	4	4	16	6	10	12	13
West Kentucky	26,277	10	3	6	11	5	10	11	13
Kentucky, unassigned LWA	102,457	4	4	5	14	7	12	5	4
Total/average	408,734	8%	4%	5%	12%	5%	12%	9%	9%

Note: EKCEP = Eastern Kentucky Concentrated Employment Program. TENCO = TENCO Workforce Investment Board.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Table E.2
Percent Of 2018 Graduates Completing CTE Pathways By Program Area And Local Workforce Area
2018

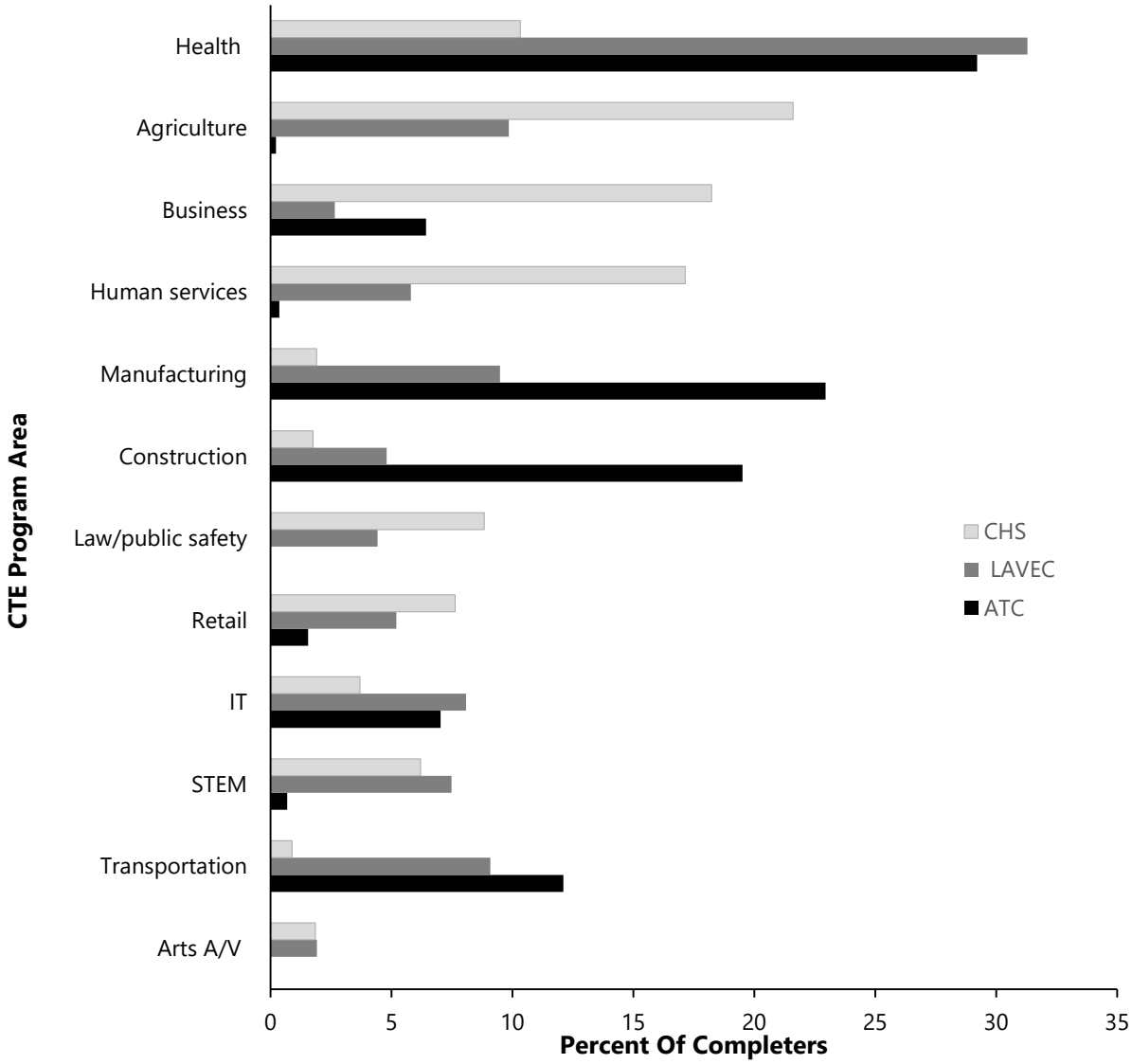
Program Area	Bluegrass	Cumberlands	EKCEP	Green River	Kentuckiana Works	Lincoln Trail	Northern Kentucky	South Central	TENCO	West Kentucky
Agriculture	5.1%	7.3%	3.9%	3.6%	1.8%	5.0%	2.1%	8.1%	7.7%	8.3%
Architecture and construction	1.4	2.6	6.2	1.1	0.5	2.9	1.9	4.2	2.6	1.7
Arts A/V	0.4	0.1	0.1	0.4	1.7	0.2	0.9	0.0	0.0	0.5
Business and administration	2.1	5.1	9.4	1.0	4.2	4.5	3.4	6.7	5.6	7.8
Health science	5.0	8.4	11.3	4.7	3.8	8.0	2.7	6.9	6.8	7.2
Human Services	4.4	5.4	5.2	3.8	3.0	4.1	2.7	5.8	6.4	7.2
Information technology	1.9	0.7	4.4	2.1	1.4	1.4	0.7	1.5	2.8	2.1
Law and public safety	1.1	3.6	4.1	3.6	3.1	2.5	0.8	2.8	3.5	2.1
Manufacturing	1.9	4.8	3.4	2.8	1.0	4.8	1.7	6.2	3.9	2.9
Retail	3.0	6.1	1.0	2.0	1.6	1.7	1.3	2.5	2.3	1.6
STEM	1.9	3.2	1.7	2.1	1.2	2.5	0.8	0.3	2.5	2.8
Transportation and logistics	1.5	2.2	3.0	1.0	0.8	2.4	1.2	2.2	2.9	2.0
Total number of graduates	8,303	3,716	4,869	2,438	9,588	3,395	4,808	3,579	2,310	4,145

Note: EKCEP = Eastern Kentucky Concentrated Employment Program. TENCO = TENCO Workforce Investment Board; A/V = audiovisual technology; STEM = science, technology, engineering, and math.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix F

CTE Pathway Completers By Program Area And CTE Delivery Model

Figure F.A
Percentage Of Pathway Completers By Program Area And CTE Delivery Model
2018



Note: CHS = comprehensive high school; LAVEC = local area vocational education center; ATC = area technology center; IT = information technology; STEM = science, technology, engineering, and math; A/V = audiovisual technology.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix G

Perceived Barriers To Adding CTE Career Pathways

Table G.1
Comprehensive High School Principals' Challenges In Adding CTE Pathways
By Program Area
2019

		Types Of Challenges Reported			
Program Area	Respondents Reporting Challenges	Qualified Teacher Not Available	Lack Of Necessary Equipment Or Supplies	Lack Of Student Interest	Pathway Not Approved By Kentucky Department Of Education
Agriculture	40	12	16	23	0
Business and marketing	16	5	5	8	0
Construction	40	12	21	18	0
Engineering technology	49	28	23	15	2
Family and consumer sciences	29	15	7	11	1
Health science	25	17	17	4	0
Information technology	30	14	12	13	1
Manufacturing technology	47	20	23	18	1
Media arts	55	21	21	25	3
Transportation	64	23	23	35	3

Note: Totals for each program area represent number of respondents finding challenges in adding career and technical education pathways in that program area. There were 137 comprehensive high school principals who responded to the survey. Respondents could answer with more than one challenge.
Source: OEA staff survey of principals and superintendents.

Table G.2
ATC School Principals' Challenges In Adding CTE Pathways
By Program Area
2019

		Types Of Challenges Reported			
Program Area	Respondents Reporting Challenges	Qualified Teacher Not Available	Lack Of Necessary Equipment Or Supplies	Lack Of Student Interest	Pathway Not Approved By Kentucky Department Of Education
Agriculture	4	1	3	3	0
Business and marketing	1	0	0	1	0
Construction	6	2	5	1	0
Engineering technology	7	3	7	3	0
Family and consumer sciences	3	1	3	0	0
Health science	2	0	1	1	0
Information technology	6	2	6	0	0
Manufacturing technology	4	2	4	1	0
Media arts	6	2	6	1	1
Transportation	4	2	4	1	0

Note: Totals for each program area represent number of respondents finding challenges in adding career and technical education pathways in that program area. There were 40 area technology center principals who responded to the survey. Respondents could answer with more than one challenge.
Source: OEA staff survey of principals and superintendents.

Table G.3
LAVEC Principals' Challenges In Adding CTE Pathways
By Program Area
2019

		Types Of Challenges Reported			
Program Area	Respondents Reporting Challenges	Qualified Teacher Not Available	Lack Of Necessary Equipment Or Supplies	Lack Of Student Interest	Pathway Not Approved By Kentucky Department Of Education
Agriculture	11	3	3	7	1
Business and marketing	5	2	2	3	0
Construction	13	4	10	3	0
Engineering technology	8	3	4	2	0
Family and consumer sciences	6	3	2	2	0
Health science	5	1	5	0	0
Information technology	6	3	3	3	0
Manufacturing technology	11	4	9	1	0
Media arts	11	5	7	4	0
Transportation	14	5	8	6	0

Note: Totals for each program area represent number of respondents finding challenges in adding career and technical education pathways in that program area. There were 30 local area vocational education center principals who responded to the survey. Respondents could answer with more than one challenge.
Source: OEA staff survey of principals and superintendents.

Appendix H

Percentage Of Graduates Completing CTE Pathways By Student Group And Program Area

Table H.1
Percentage Of Graduates Completing CTE Pathways By Student Group And Program Area 2018

	Category (students)							
Program Area	**Female** (23,183)	**Male** (23,974)	**All** (47,157)	**White** (39,605)	**Black** (5,482)	**Hispanic** (2,576)	**FRPL** (24,454)	**IEP** (3,443)
Agriculture	4.3%	5.2%	4.7%	5.4%	0.8%	0.2%	4.4%	4.7%
Construction	0.2	4.2	2.3	2.6	0.6	0.1	2.8	4.6
Arts A/V	0.7	0.5	0.6	0.5	0.8	0.0	0.4	0.1
Business	4.6	5.0	4.8	5.0	3.7	0.2	4.3	1.9
Health	10.3	1.9	6.1	6.4	4.4	0.2	6.2	1.3
Hospitality	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Human services	7.7	1.4	4.5	4.7	3.4	0.2	5.3	4.9
IT	0.5	3.2	1.8	2.0	0.9	0.1	1.8	1.7
Law/safety	1.7	3.3	2.6	2.6	1.9	0.1	3.3	3.3
Manufacturing	0.4	5.2	2.8	3.2	0.8	0.1	2.9	3.8
Retail	1.8	2.7	2.3	2.3	1.8	0.1	1.9	1.0
STEM	0.5	3.0	1.8	2.0	0.7	0.1	1.2	0.7
Transportation	0.2	3.2	1.7	1.9	0.6	0.1	2.1	3.6

Note: FRPL = free and reduced-price lunch; IEP = individualized education program; A/V = audiovisual technology; IT = information technology; STEM = science, technology, engineering, and math.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix I

CTE Completers Successfully Completing Dual-Credit Classes, Cooperative Education Credits, And Industry Certificates

Table I.1
Percentage Of Completers Earning C Or Above In A Dual-Credit Class, Credit For Cooperative Education, Or Meeting Benchmark On KOSSA Exam Or Industry Certificate By Program Area
2018

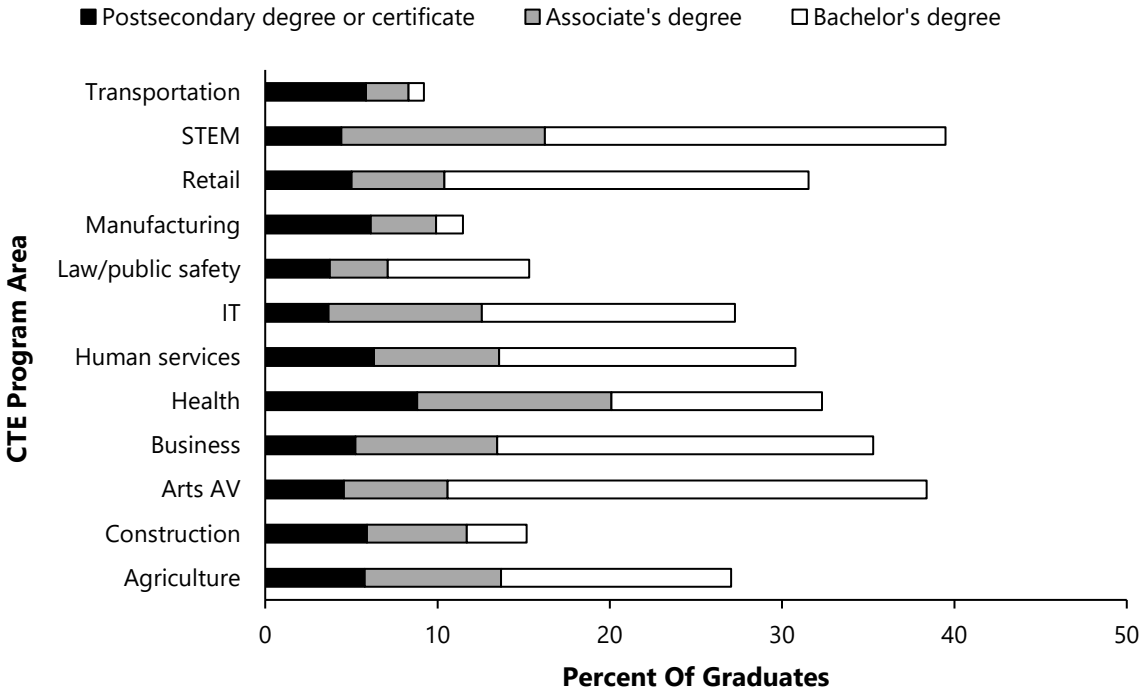
		Percent		
Program Area	Total Number	Dual-Credit Class	Cooperative Education Credit	KOSSA Or Industry Certificate
Agriculture	2,235	32%	26%	72%
Construction	1,064	17	14	67
Arts A/V	276	15	13	78
Business	2,263	38	15	63
Health	2,854	51	13	80
Human services	2,123	27	12	75
IT	868	27	7	73
Law and public safety	1,203	15	3	48
Manufacturing	1,341	28	16	75
Retail	1,063	33	34	74
STEM	836	43	12	82
Transportation and logistics	814	14	16	65

Note: KOSSA = Kentucky Occupational Skill Standards Assessment; A/V = audiovisual technology; IT = information technology; STEM = science, technology, engineering, and math.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix J

Career And Technical Education Pathway Completion And Postsecondary Education

Figure J.A
Percentage Of 2013 CTE Pathway-Completing Graduates By Level Of Postsecondary Education Through 2018



Note: The figure reports education levels by program area whether or not the postsecondary education was attained in the academic area of CTE completion. For example, less than half of the CTE health completers who went on to earn a postsecondary credential or degree did so in health. CTE = career and technical education; STEM = science, technology, engineering, and math; IT = information technology; AV = audiovisual technology.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix K

Career And Technical Education Graduate's Workforce Outcomes

Table K.1
Percentage Of 2013 Graduates With No Postsecondary Degree Or Credential Working In Major Workforce Sectors By CTE Program
2018

CTE Program Area	Total Working	Food Service And Accommodation	Admin. Support	Construction	Health Care And Social Assistance	Manufacturing
Agriculture	1,262	7%	9%	10%	10%	21%
Construction	657	6	11	17	4	22
Arts A/V	196	11	7	0	8	17
Business	1,554	10	9	5	11	15
Health	807	11	9	0	31	8
Human services	923	15	9	1	21	13
IT	334	9	12	3	7	18
Law/safety	531	13	14	3	7	19
Manufacturing	667	4	8	16	1	35
Retail	129	14	10	0	8	11
Transportation	583	5	11	11	2	22
All completers	6,860	10	10	7	11	18
Noncompleters	12,626	15	12	4	9	13

Note: CTE = career and technical education; A/V = audiovisual technology; IT = information technology.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Table K.2
2018 Average Wages Of 2013 Graduates With No Postsecondary Degree Or Credential By Workforce Sector And CTE Program Completion

Workforce Sector	Food Service And Accom.	Admin Support	Construction	Health Care And Social Assistance	Manufacturing	Public Admin.	Retail	Transportation And Warehousing	Wholesale Trade
Agriculture	$12,794	$14,732	$34,193	$19,095	$36,518	$29,060	$19,782	$30,703	$26,413
Construction	11,535	17,933	31,809	18,763	33,159	27,130	16,357	15,973	28,554
Arts A/V	15,640	13,534	N/A	15,807	34,963	N/A	20,079	14,279	N/A
Business	14,056	17,526	27,129	18,716	35,235	26,126	18,653	25,006	N/A
Health	12,409	13,133	N/A	19,324	28,624	24,321	14,910	19,617	23,495
Human services	13,306	14,648	24,881	15,898	29,664	19,996	18,315	25,878	20,106
IT	13,781	16,654	N/A	15,520	32,211	N/A	16,521	23,547	31,734
Law/safety	12,202	18,803	36,016	18,885	30,841	27,599	16,957	21,844	28,414
Manufacturing	12,426	17,606	31,396	N/A	36,250	34,922	20,087	33,512	29,150
Retail	17,375	17,456	N/A	18,522	38,589	N/A	21,348	N/A	N/A
Transportation	13,296	16,103	34,046	17,568	34,947	29,689	21,646	23,202	29,287
All completers	13,126	16,097	31,602	18,274	34,421	27,316	17,918	24,555	27,650
All noncompleters	11,919	12,735	24,803	18,048	31,461	28,267	15,763	22,102	23,884
All CTE wage premium	10%	26%	27%	1%	9%	None	14%	11%	16%

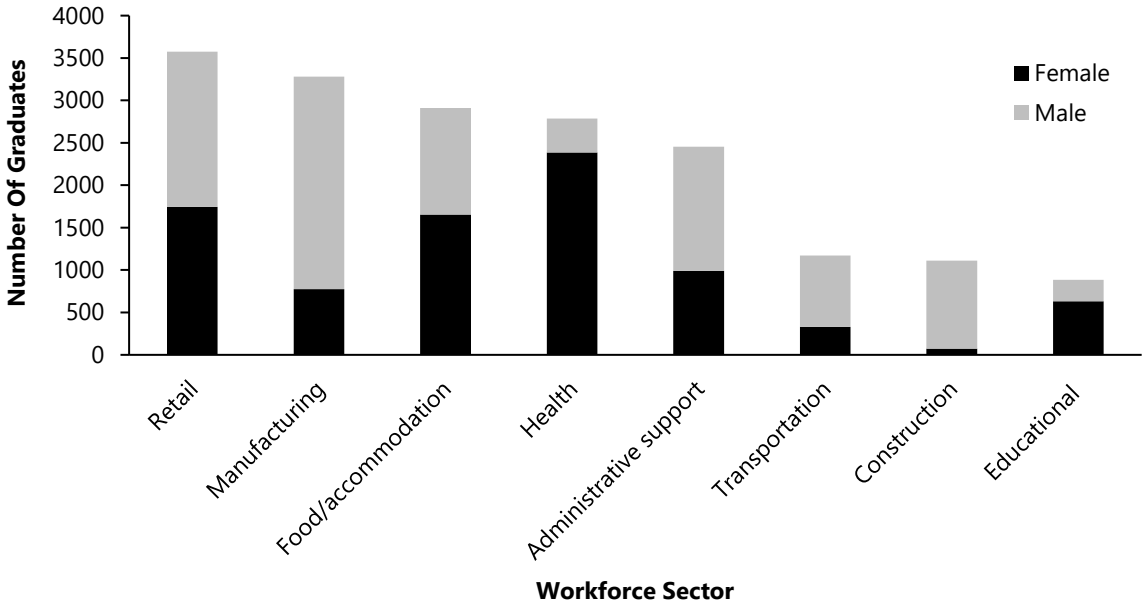
Note: CTE = career and technical education; A/V = audiovisual technology; IT = information technology.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix L

Number Of 2013 Graduates By Industry Sector And Gender

Figure L.A shows the number of 2013 graduates employed in major industry sectors in 2018, by gender. It shows the proportionately lower number of female graduates working in the manufacturing, transportation, construction, and administrative support sectors and the proportionately lower number of male graduates working in the health, educational, and food/accommodation sectors.

Figure L.A
Number Of 2013 Graduates By Industry Sector And Gender, 2018



Note: The figure includes graduates of all postsecondary education levels but does not include any graduates enrolled in postsecondary education in 2018.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix M

Major Industry Average Wages By Education Level

Table M.1
Major Industry Average Wages By Education Level
2013 Graduates Working In 2018

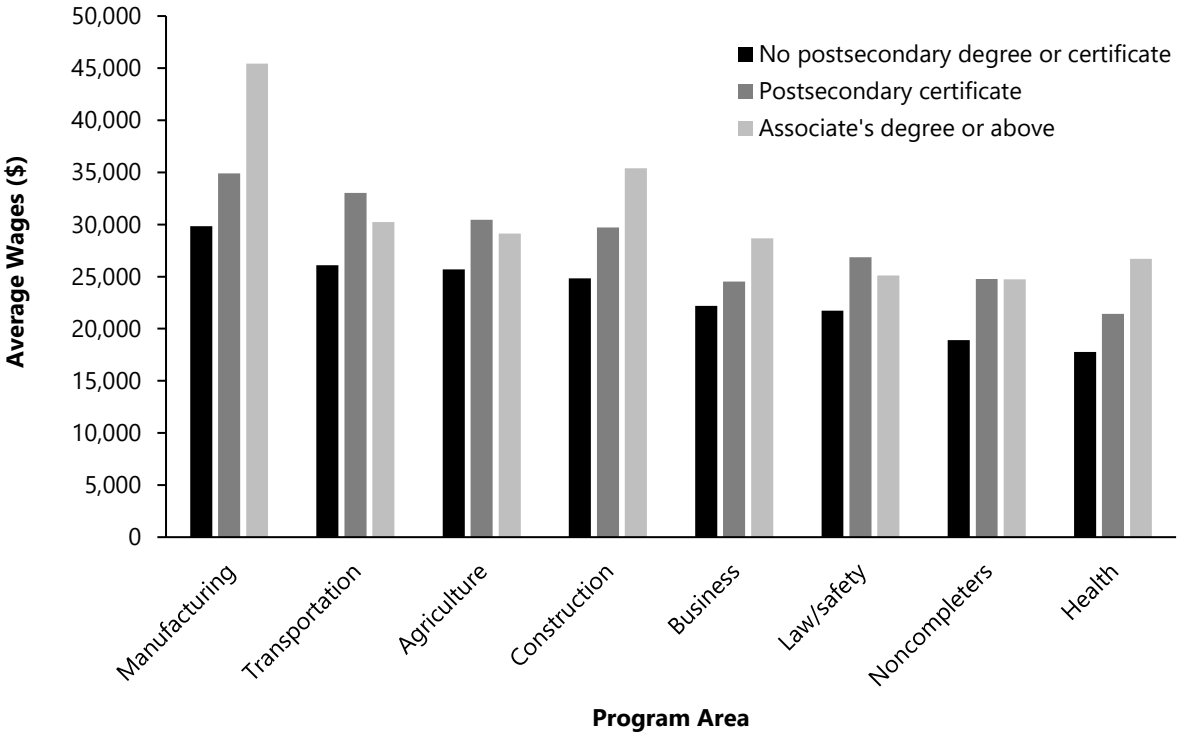
	No Postsecondary Degree Or Certificate		Postsecondary Certificate		Associate's Degree Or Above	
Workforce Sector	**Number**	**Wages**	**Number**	**Wages**	**Number**	**Wages**
Accommodation and food services	2,625	$12,227	46	$15,284	241	$13,279
Administrative support and waste management and remediation services	2,244	13,783	57	20,140	155	22,866
Agriculture, forestry, fishing, and hunting	44	24,214	N/A		12	22,690
Arts, entertainment, and recreation	154	11,513			66	11,401
Construction	987	28,082	42	30,405	83	31,568
Educational services	293	14,904	24	17,983	569	29,469
Finance and insurance	427	25,541	24	24,246	210	28,368
Health care and social assistance	1,900	18,134	276	25,296	613	29,436
Information	254	22,753	12	26,721	81	22,524
Management of companies and enterprises	54	21,555	N/A		18	32,800
Manufacturing	2,930	32,714	115	38,348	238	43,016
Mining, quarrying, and oil and gas extraction	54	42,534	N/A		N/A	
Other services (except public administration)	413	20,506	25	23,065	57	17,711
Professional, scientific, and technical services	430	19,054	15	22,646	235	24,902
Public administration	425	27,818	20	35,181	155	27,257
Real estate and rental and leasing	184	21,386	N/A		43	22,338
Retail trade	3,018	16,507	130	16,731	425	16,063
Transportation and warehousing	1,056	22,855	36	31,267	81	24,338
Utilities	62	43,917	N/A		19	50,279
Wholesale trade	578	25,298	20	29,980	96	31,590
(Blank)	1,354	15,767	52	21,445	202	22,823
Grand total	19,486	20,192	925	25,463	3,603	25,920

Note: N/A = not available due to redaction. Industry sectors include various job class codes. For example, those working in the health sector include janitors, drivers, and cooks. Table includes only those graduates who were not enrolled in postsecondary education at any point in the 2018 school year.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix N

Wages Of CTE Graduates By Education And CTE Program Area

Figure N.A
Average Wages Of 2013 CTE Graduates
By Level Of Education And CTE Program Area, 2018



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

Table N.1
Average Wages Of 2013 CTE Graduates By Level Of Education And CTE Program Area
2018

CTE Program Area	No Postsecondary Degree Or Certificate	Postsecondary Certificate	Associate's Degree Or Above
Manufacturing	$29,827	$34,891	$45,450
Transportation	26,077	33,020	30,230
Agriculture	25,683	30,444	29,133
Construction	24,847	29,714	35,398
STEM	24,199	N/A	46,225
Retail	23,249	N/A	21,342
Business	22,205	24,510	28,678
Law/safety	21,741	26,852	25,108
IT	21,290	27,727	23,151
Education	20,192	15,051	29,084
Food sciences	18,979	20,191	25,290
Noncompleters	18,900	24,764	24,745
Health	17,763	21,434	26,712

Note: CTE = career and technical education; STEM = science, technology, engineering, and math; IT = information technology; N/A = not available due to redaction.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix O

Highest-Earning CTE Pathways

Table O.1
20 Highest-Wage Career And Technical Education Pathways
For 2013 High School Graduates With No College Degree
2018

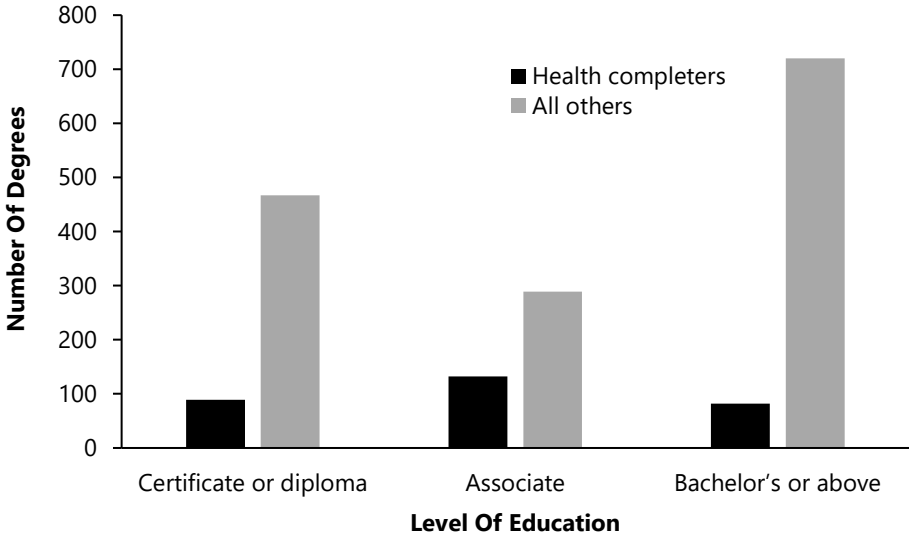
Pathway	Number Of Graduates	Average Wages
Heavy equipment sciences	10	$37,663
Computerized manufacturing and machining	88	33,183
Air conditioning technology	20	32,225
Welding (manufacturing)	440	29,933
Industrial maintenance technology	60	29,540
Agriculture power structured technology systems	307	29,521
Metal fabrication	11	28,749
Agriculture education/communications and leadership	18	28,357
Machine tool technology—secondary	36	27,962
Electricity	204	27,937
Computer-aided drafting	26	27,050
Automotive technology	460	26,603
Marketing technology	26	26,059
Animal systems	527	25,976
Wood products (manufacturing)	37	25,928
Environmental sciences/natural resources systems	84	25,872
Fire protection and safety technology	17	25,620
Technology	161	25,283
Diesel technology	41	24,575
Auto body collision/repair technician	96	24,471

Note: Includes only graduates not enrolled in postsecondary education in 2018. Includes graduates who earned a postsecondary certificate but none who earned a degree of associate or above.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix P

Workforce And Postsecondary Education Outcomes Of 2013 Health Pathway Completers

Figure P.A
Number Of Postsecondary Credentials Earned In Health Fields By Class Of 2013 Graduates Through 2018, Health Pathway Completers And All Other Graduates



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

Table P.1
Percentage Of 2013 Graduates Earning Postsecondary Credentials Or Degrees In Health And Other Fields Through 2018, High School Health Pathway Completers And All Other Graduates

	Health (1,996)		All Others (42,470)	
Postsecondary Credential	Health Fields	Other Fields	Health Fields	Other Fields
Certificate or diploma	4%	9%	1%	4%
Associate's degree	7	11	1	5
Bachelor's or above	4	12	2	17

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

Table P.2
Average Wages Of 2013 Graduates With Postsecondary Education In Health Fields By Postsecondary Education Level, High School CTE Health Pathway Completers And All Others 2018

High School	Postsecondary Certificate		Associate's Degree		Bachelor's Degree Or Higher	
CTE Pathway	Number	Wages	Number	Wages	Number	Wages
Health	39	$23,818	50	$32,840	32	$34,767
All others	216	25,791	120	30,951	223	37,219

Note: Includes only graduates not enrolled in postsecondary education in 2018.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix Q

Workforce Participation And Average Wages By CTE Pathway Completion And Local Workforce Area

Table Q.1 shows workforce participation rates, wages, and salaries for 2017 graduates who did and did not complete career and technical education pathways by local workforce area. Across all workforce areas, CTE completers earned more than noncompleters and were more likely to participate in the workforce.

Table Q.1
Workforce Participation And Average Wages Of 2017 Graduates By CTE Pathway Completion and Local Workforce Area, 2018

	Average Wages			Workforce Participation	
Local Workforce Area	CTE Noncompleter	CTE Completer	CTE Wage Premium	CTE Noncompleter	CTE Completer
Bluegrass (n=2,621)	$9,159	$12,250	34%	73%	78%
Cumberlands (n=1,171)	9,791	12,356	26	71	79
EKCEP (n=1,142)	7,877	10,338	31	51	64
Green River (n=774)	8,745	11,927	36	61	76
Kentuckiana Works (n=3,632)	9,728	12,252	26	76	83
Lincoln Trail (n=1,170)	9,866	13,762	39	74	79
Northern Kentucky (n=1,753)	9,711	12,154	25	76	76
South Central (n=1,270)	9,827	13,394	36	70	79
TENCO (n=771)	8,213	10,819	32	65	75
West Kentucky (n=1,285)	8,619	10,602	23	63	71
State (n=15,682)	$9,305	$12,036	29%	70%	76%

Note: State total may not sum to local workforce area totals as some graduates are not assigned to districts for accountability purposes. EKCEP = Eastern Kentucky Concentrated Employment Program;
TENCO = TENCO Workforce Investment Board.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix R

Highest-Earning Industry Certificates

Table R.1 shows the highest-earning industry certificates for 2017 graduates working in 2018. The table reflects only those certificate earners not enrolled in a postsecondary education institution. Average wages for all 2017 graduates not enrolled in postsecondary education in 2018 were $10,208.

Table R.1
Highest-Wage Industry Certificates Of 2017 Graduates
Not Enrolled In Postsecondary Education
2018

Industry Certificate	Number Of Graduates	Average Wages
NIMS—Machine Tool Certification (Level 1)	49	$22,432
NCCER—Electrical Technician (Level 1)	18	20,591
ASE Student Certification—Suspension and Steering	77	17,998
2-F (AWS) Qualification Certification	167	17,636
AWS-Sense Certification (Level 1)	45	17,004
Kentucky TRACK Pre-Apprenticeship Certification	32	16,832
Kentucky Department of Transportation 3-G	180	16,755
ASE Student Certification—Brakes	104	16,559
ASE Student Certification—Automotive Maintenance and Light Repair	209	16,306
ASE Student Certification—Electrical/Electronic Systems	75	16,011
WCA—Woodwork Career Alliance (Green Credential)	15	15,813
Microsoft Access	13	15,761
Adobe—DreamWeaver	14	15,693
ASE Student Certification—Diesel Engines	12	15,469
EPA Section 608 Certification	32	15,080
ASE Student Certification—Engine Repair	14	14,731
NCCER—Industrial Maintenance Electrical & Instrumentation Technician (Level 1)	20	14,644
Internet and Computing Core Certification (IC3-3 Exams Required)	21	14,546
CompTia Strata IT Fundamentals	10	14,231
Autodesk Inventor Certified User	16	14,121

Note: Includes only graduates not enrolled in postsecondary education in 2018. The analysis eliminates the many higher-wage industry certificates that had fewer than 10 graduates working and not enrolled. Kentucky Occupational Skill Standards Assessment exam data were not available for this report. NIMS = National Institute for Metalworking Skills; NCCER = National Center for Construction Education and Research; ASE = National Institute for Automotive Service Excellence; AWS = American Welding Society; TRACK = Tech Ready Apprentices for Careers in Kentucky; EPA = Environmental Protection Agency; IT = information technology.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix S

2018 Outcomes Of 2017 Graduates, Additional Indicators

Tables S.1 and S.2 show substantial wage premiums for both CTE completers and noncompleters who completed a cooperative education course (25 percent and 23 percent, respectively).

Table S.1
Average Wages By Cooperative Education Credit Completion And Grade Point Average
CTE Pathway Completers, 2018

	Earned Cooperative Credit		Did Not Earn Cooperative Credit		
GPA	Number	Wages	Number	Wages	Co-op Wage Premium
< 2	60	$12,516	616	$10,937	14%
2 to 2.99	387	15,469	2,605	11,951	29
3 to 3.5	197	14,446	909	11,782	23
> 3.5	67	11,557	344	10,103	15
Total	711	14,568	4,475	11,633	25

Note: Includes only graduates not enrolled in postsecondary education in 2018. Totals include students for whom GPA data were not available. GPA = grade point average.
Source: Staff analysis of data from the Kentucky Center for Statistics

Table S.2
Average Wages By Cooperative Education Credit Completion And Grade Point Average
CTE Noncompleters, 2018

	Earned Cooperative Credit		Did Not Earn Cooperative Credit		
GPA	Number	Wages	Number	Wages	Co-op Wage Premium
< 2	188	$10,679	2,394	$8,920	20%
2 to 2.99	480	11,667	4,649	9,872	18
3 to 3.5	142	11,592	1,484	9,682	20
> 3.5	83	8,803	1,009	5,531	59
Total	895	11,195	9,601	9,129	23

Note: Includes only graduates not enrolled in postsecondary education in 2018. Totals include students for whom GPA data were not available. GPA = grade point average.
Source: Staff analysis of data from the Kentucky Center for Statistics

Tables S.3 and S.4 show postsecondary enrollment rates for 2017 high school graduates who did and did not complete dual-credit courses. The analyses are completed for career and technical education pathway completers and noncompleters.

Table S.3
Postsecondary Enrollment Rates By High School Grade Point Average And Dual-Credit Course Completion
Pathway Completers 2017 Enrolled In 2018

	Earned Dual Credit			Did Not Earn Dual Credit		
GPA	Number Dual Credit	Number Enrolled	Percent Enrolled	Number Dual Credit	Number Enrolled	Percent Enrolled
2 to 2.99	742	350	47	5,268	1,836	35
3 to 3.5	1,235	945	77	2,961	1,758	59
> 3.5	1,817	1,611	89	2,020	1,596	79

Note: The students with GPAs below 2.0 were redacted due to low n counts. Totals include students for whom GPA data were not available. GPA = grade point average
Source: Staff analysis of data from the Kentucky Center for Statistics.

Table S.4
Postsecondary Enrollment Rates By High School Grade Point Average And Dual-Credit Course Completion
CTE Noncompleters 2017 Enrolled In 2018

	Earned Dual Credit			Did Not Earn Dual Credit		
GPA	Number Dual Credit	Number Enrolled	Percent Enrolled	Number Dual Credit	Number Enrolled	Percent Enrolled
2 to 2.99	856	495	58	10,222	3,727	36
3 to 3.5	1,696	1,326	78	5,406	3,429	63
> 3.5	3,270	2,796	86	5,092	3,589	70

Note: The students with GPAs below 2.0 were redacted due to low n counts. Totals include students for whom GPA data were not available. GPA = grade point average.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Appendix T

CTE Wage Premiums By Student Group

Table T.1 shows CTE wage premiums for 2015 graduates working in 2018 with no postsecondary degree or credential by whether they had been eligible for free or reduced-price lunch in high school. The CTE wage premium was greater for ineligible students (30 percent) than it was for eligible students (19 percent).

Table T.1
Average Wages 2015 Graduates With No Postsecondary Degree Or Credential
By Pathway Completion And FRPL Eligibility
2018

	CTE Completers		CTE Noncompleters		CTE Wage
	Number	Wages	Number	Wages	Premium
FRPL	3,894	$16,994	7,710	$14,328	19%
Not FRPL	2,308	20,737	4,803	15,944	30

Note: FRPL = eligible for free or reduced-price lunch; CTE = career and technical education. Includes only graduates not enrolled in postsecondary education in 2018.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Table T.2 shows that CTE wage premiums are greater for white completers (22 percent) than for black or Hispanic completers (20 percent and 14 percent, respectively).

Table T.2
Average Wages 2015 Graduates With No Postsecondary Degree Or Credential
By Pathway Completion And Race And Ethnicity
2018

	CTE Completers		CTE Noncompleters		CTE Wage
Race/Ethnicity	Number	Wages	Number	Wages	Premium
Black	450	$15,090	1,994	$12,526	20%
Hispanic	202	19,657	530	17,249	14
White	5,546	18,671	9,840	15,333	22

Note: Includes only graduates not enrolled in postsecondary education in 2018. CTE = career and technical education.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Table T.3 shows 2018 CTE wage premiums for 2017 graduates by eligibility for individualized education programs (IEPs). CTE wage premiums of 29 percent were similar for IEP completers and noncompleters.

Table T.3
Average Wages 2017 Graduates With No Postsecondary Degree Or Credential By Pathway Completion And IEP Eligibility
2018

	CTE Completers		CTE Noncompleters		CTE Wage
	Number	Wages	Number	Wages	Premium
IEP	443	$10,526	991	$8,189	29%
Not IEP	4,743	12,176	9,505	9,421	29

Note: Includes only graduates not enrolled in postsecondary education in 2018. CTE = career and technical education; IEP = individualized education program. Complete data for IEP completers in 2015 were not available for this report.
Source: Staff analysis of data from the Kentucky Center for Statistics.

Endnotes

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[9] Williams, Josh. *A Case For Change: The Movement Toward Employer Led Workforce Systems.* Presentation to the Kentucky Center for Statistics Data Use Conference, Sept. 4, 2019.
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