In 2019, California enacted the Cradle-to-Career Data System Act (Act), which called for the establishment of a state longitudinal data system to link existing education, social services, and workforce information. The Act also articulated the scope of an 18-month planning process to be shaped by a workgroup that consists of the partner entities named in the Act. Suggestions from this workgroup will inform a report to the legislature and the designs for the state data system to be approved by the Governor’s Office. The Research Agenda Subcommittee will support the workgroup by helping to identify parameters for research on the six priority areas spelled out in the legislation (see box on page 2).

This brief supports the ongoing efforts of the Research Agenda Subcommittee by describing how other states and researchers have utilized linked data systems to examine the sixth of the six priority areas outlined in the Act: the workforce effect of graduation from high school, community college, and four-year postsecondary education institutions (each meeting of the Research Agenda Subcommittee will focus on one of the priority areas).

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1 Read the California Cradle-to-Career Data System Act at: https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=EDC&division=1.&title=1.&part=7.&chapter=8.5.&article=

2 The partner entities include the Association of Independent California Colleges and Universities, Bureau for Private Postsecondary Education, California Community Colleges, California Department of Education, California Department of Social Services, California Department of Technology, California Health and Human Services Agency, California School Information Services, California State University, California Student Aid Commission, Commission on Teacher Credentialing, Employment Development Department, Labor and Workforce Development Agency, State Board of Education, and University of California.
Priority Policy Questions from the California Cradle-to-Career Data System Act

Without a state data system that links information between agencies, it is difficult to answer foundational questions about the impact of state policies and investments. Legislators identified the following topics, which the state data system must be able to address:

- The impact of early education on student success and achievement as a student progresses through education segments and the workforce;
- The long-term effect of state intervention programs and targeted resource allocations in primary education;
- How prepared high school pupils are to succeed in college;
- How long it takes students who transfer from community college to the University of California, the California State University, or another four-year postsecondary education institution to graduate with a baccalaureate degree;
- College access, completion, and long-term effects of access to state financial aid; and
- The workforce effect of graduation from high school, community college, and four-year postsecondary education institutions.

Research into the Workforce Effects of High School and Postsecondary Completion

Much prior academic research has examined the workforce effects of completing high school and postsecondary education. This collective body of literature covers a large and diverse array of empirical questions, academic disciplines, and methodological orientations. But across these studies, one outcome is clear: education drives social and economic mobility.

Data from the Bureau of Labor Statistics (BLS) illustrates that “the more one learns, the more one earns” (Torpey, 2019). Compared to students who earn a traditional high school diploma, students who fail to complete high school earn less and are more likely to be unemployed (Rumberger, 2011). Students with postsecondary education earn more, on average, than their counterparts with only a high school diploma (Torpey,
Returns to education extend beyond wages; Americans with higher education levels are less likely to be adversely impacted by seasonal economic fluctuations and recessions (Hoynes, 2000). For example, workers with lower education levels were displaced in greater numbers by the Great Recession (Farber, 2015). These workers also had a much more difficult time rebounding after the recession officially ended (Bauer & Shambaugh, 2018). Unsurprisingly, the sweeping economic consequences of COVID-19 have fallen disproportionately on those with less formal education and training, while workers with postsecondary education and, in particular, bachelor’s degrees, have been somewhat insured against job loss (Bureau of Labor Statistics, 2020; Daly et al., 2020).

Given that educational attainment is such a strong predictor for success in the labor market, understanding the workforce effects of completion is crucial for many California stakeholders. For parents, such information can support decision-making related to whether and/or where their children should attend college. Data on the average labor market returns to postsecondary degrees and credentials can help students choose their areas of study. For policymakers, information on the workforce effects of completion can drive and refine policymaking as well as inform future resource allocations. For taxpayers, data on the workforce outcomes of secondary and postsecondary schools can shed light on the social and economic returns to public education funding.

While researchers and organizations working with longitudinal intersegmental data have previously analyzed the workforce effects of completion, a California state data system linking secondary, postsecondary, and workforce data would encourage additional research in this area. A state data system would also increase transparency by allowing for the development and dissemination of publicly available reports and data visualizations related to the workforce outcomes of students in California.

Readers interested in learning more about the extant academic literature pertaining to the workforce effects of completion may wish to visit the Georgetown University Center on Education and the Workforce3 which regularly produces research reports related to education, skill attainment, and economic mobility. Opportunity Insights4 based at Harvard University is another organization that delivers timely, high-impact research related to education and economic opportunity. Readers may also wish to visit the

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3 Visit the Center on Education and the Workforce here: https://cew.georgetown.edu/
4 Visit Opportunity Insights here: https://opportunityinsights.org/
Hamilton Project\textsuperscript{5} at the Brookings Institution, and the Center for Labor Research and Education at UC Berkeley\textsuperscript{6} The BLS,\textsuperscript{7} the National Center for Education Statistics,\textsuperscript{8} and the U.S. Census Bureau\textsuperscript{9} regularly collect, analyze, and report on national education and employment data. Readers interested in reading peer-reviewed academic research may want to begin with the archives of the following academic journals: Educational Evaluation and Policy Analysis,\textsuperscript{10} Economics of Education Review,\textsuperscript{11} Education Finance and Policy,\textsuperscript{12} American Economic Review,\textsuperscript{13} and Journal of Human Resources.\textsuperscript{14}

**Use of Workforce Outcomes Data by State Data Systems**

While prior research on the workforce effects of completion has addressed a broad set of empirical questions, many states have focused their publicly available data on three general inquiry areas:

1. What are the workforce effects of increased educational attainment?
2. To what extent are earnings and employment outcomes a function of where students attend high school and college?
3. What are the labor market returns to individual postsecondary credentials and programs of study?

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\textsuperscript{5} Visit the Hamilton Project here: https://www.hamiltonproject.org/

\textsuperscript{6} Visit the UC Berkeley Labor Center here: http://laborcenter.berkeley.edu/

\textsuperscript{7} Visit Career Outlook by the U.S Bureau of Labor Statistics here: https://www.bls.gov/careeroutlook/home.htm

\textsuperscript{8} Visit Fast Facts by the National Center for Education Statistics here: https://nces.ed.gov/fastfacts/

\textsuperscript{9} Visit Educational Attainment by the U.S. Census Bureau here: https://www.census.gov/newsroom/press-releases/2020/educational-attainment.html

\textsuperscript{10} Access Educational Evaluation and Policy Analysis here: https://journals.sagepub.com/home/epa

\textsuperscript{11} Access Economics of Education Review here: https://www.journals.elsevier.com/economics-of-education-review

\textsuperscript{12} Access Education Finance and Policy here: https://www.mitpressjournals.org/loi/edfp

\textsuperscript{13} Access American Economic Review here: https://www.aeaweb.org/journals/aer

\textsuperscript{14} Access Journal of Human Resources here: http://jhr.uwpress.org/
**Returns to Educational Attainment.** Many state entities have utilized their longitudinal data systems to report on and visualize the workforce effects of students who have completed varying levels of education. For example, the Education Research Data Center (ERDC) in Washington leveraged their state data system to analyze and report earnings among high school dropouts who did and did not earn a high school diploma equivalency such as a GED (Chen, 2015). The study found that, overall, there were no net earnings gains for GED recipients, potentially because GEDs have unclear signaling value in the labor market and because GED earners are, according to Heckman, Humphries, and Mader (2010), no different from high school dropouts.

Researchers at the Maryland Longitudinal Data System (MLDS) also used their state data system to study the workforce outcomes of high school dropouts. Specifically, MLDS researchers visualized the median wages for high school dropouts and graduates who elected to not pursue postsecondary education.¹⁵ Researchers at the Minnesota Statewide Longitudinal Education Data System (SLEDS) visualized the employment rate, number of hours worked per week, and hourly earnings of Minnesota high school graduates who did not elect to pursue postsecondary education after high school.¹⁶

Researchers at ERDC have also made available a series of data visualizations specifically related to the workforce effects of completing increasing levels of education. Figure 1 is a snapshot taken from one of these interactive visualizations. As the figure illustrates, Washington high school graduates who completed higher levels of postsecondary education and training earned more, on average, than their counterparts with only a high school diploma. A comparison of the annual earnings of postsecondary completers in Oregon illustrated the same relationship between increased educational attainment and earnings.¹⁷

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¹⁵ See the MLDS data visualization here: https://mldscenter.maryland.gov/webcenter/faces/oracle/webcenter/page/scopedMD/sb3e45ed1_78e6_444d_ad7c_45287d460e8a/Page66.jspx?adf.ctrl-state=jgtpxc7d1_72&_afrLoop=860828361269578%26_afrState%3DA860828361269578%26_qf_rstate%3Dwuufuxonr_21

¹⁶ See the SLEDS Entering the Workforce visualization here: http://sleds.mn.gov/#HSGraduatesToEmployment/orgId--999999000__groupType--state_ECODEREGION--FOC_NONE_hsGradEmploymentCOHORTID--2018_p--3

¹⁷ See the Oregon visualization here: https://www.oregon.gov/highered/research/Documents/Snapshots/Statewide-Snapshot.pdf
Returns to High School and College. In addition to the workforce effects of completing varying levels of education, many state data system entities report on and visualize the aggregate workforce outcomes of students who attended particular high school and postsecondary institutions within their state. For example, the Kentucky Center for Statistics (KYSTATS) provides comprehensive and interactive postsecondary feedback reports that allow users to visualize earnings and employment outcomes disaggregated by postsecondary institution (see Figure 2). Researchers at ERDC have also created a data visualization tool that allows users to disaggregate employment and earnings by Washington postsecondary institutions.19

18 See the ERDC High School Graduate Outcomes visualization here: https://erdc.wa.gov/data-dashboards/high-school-graduate-outcomes

19 See the ERDC Earnings for Graduates visualization here: https://erdc.wa.gov/data-dashboards/earnings-for-graduates
The Texas Consumer Resource for Education and Workforce Statistics (CREWS) is another comprehensive data visualization tool that allows users to visualize the earnings of Texas public postsecondary school graduates (see Figure 3). One can see from Figure 3 that by connecting student financial aid and employment data, Texas CREWS has the unique ability to report the average loan to first-year wage ratio for students.

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20 See the KYSTATS Postsecondary Feedback Report here: https://kcews.ky.gov/Latest/PSFR
Returns to Degree Programs. Many state data systems show the returns to specific programs. For example, the Minnesota Department of Employment and Economic Development created a data visualization that shows employment rates and earnings of Minnesota graduates by educational attainment level and instructional program. As one can see from on the left side of Figure 4, students with higher levels of educational attainment earned more, on average, than their peers with certificates or associate degrees. The left side of Figure 4 also shows that Minnesota students who studied

\[21\] See the CREWS data visualization here: http://reports.thecb.state.tx.us/approot/thecb_tcr_ews/figure2.htm
Computer and Information Sciences earned more than postsecondary graduates overall, even if their highest level of education is a community college certificate. Similar conclusions can be drawn from the state of Washington, where ERDC researchers have created a visualization to show the average earnings of Washington postsecondary graduates by program area (see right side of Figure 4).

Figure 4: SLEDs and ERDC Graduate Employment Outcomes

Figures 2 and 3 show that like SLEDs and ERDC (Figure 4), KYSTATS and CREWS also report on and visualize average earnings by instructional program area.

Additional Workforce Inquiry Areas. The Research Agenda Subcommittee may want to consider additional areas of inquiry related to the workforce effects of completion. For example, the Utah Data Research Center (UDRC) leveraged its state data system to report on and visualize workforce retention, the rate at which Utah postsecondary graduates move into the Utah workforce.23 UDRC researchers also created an Industry Success webpage that quantifies the alignment between education and industry needs, such as noting the proportion of postsecondary graduates in high-demand fields, as well as the number of individuals and companies served by subsidized custom training programs.24

KYSTATS researchers tackled the issue of education-industry alignment by creating a Work Ready Communities visualization that shows the degree to which each county in Kentucky meets work-ready criteria including the proportion of the working population without a high school diploma, the high school graduation rate, how many individuals enrolled in college, how many completed at least an associate degree, and internet availability and speed.25

Researchers at the Iowa Department of Education utilized their state data system to report on the relationship between the career and technical education (CTE) programs that students complete and the industries where they secure jobs (see Figure 5). This chart shows how some majors lead directly to specific industries, such as students who major in Health Science largely being employed by the healthcare and social assistance sector. Other majors, like Business, Management & Administration, lead predominantly to jobs in manufacturing or retail. A significant number of Business majors also appear in the No Match category, which could mean that they are self-employed (for an explanation, see the box on employment data sources and elements on page 12).

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23 See the UDRC Workforce Retention data visualization here: https://udrc.utah.gov/workforceretention/index.html
24 See the UDRC industry alignment visualization here: https://udrc.utah.gov/p20/IndusSuc.html
25 See the KYSTATS Work Ready Communities visualization here: https://kcews.ky.gov/Latest/WRC
Figure 5: Iowa Department of Education Cluster to Industry Map

Employment Data Sources and Elements

Two challenges for California related to workforce information include the lack of information on: 1) individuals who are self-employed or do not have a valid social security number and 2) the types of jobs that individuals hold. Most states, including California, use the unemployment insurance data system to determine employment and earnings. However, self-employed individuals and those without social security numbers, along with other categories of workers such as gig workers, employees of the federal government, or members of the armed forces, are not tracked in this system. One possibility would be for California to secure employment and earnings data from the Franchise Tax Board, which would provide a more comprehensive data set.

Furthermore, in most states, the unemployment insurance system only collects information on an employer’s industry, as opposed to an individual’s occupation. This means that all people employed by a construction company would be reported as working in the construction industry, whether they were the president of the company, an accounting clerk, or an expert in laying drywall. Some states like Washington also collect occupational information, which would make it easier to discern whether students are employed in their field of study. California could follow suit, but this would increase the reporting requirements on employers.

Workforce Effects of School Completion in California

In the state of California, researchers with linked data records have previously analyzed the workforce effects of completion. For example, Stevens, Kurlaender, and Grosz (2019) analyzed earnings gains among California community college CTE certificate and degree completers, and found large returns to programs in Health Sciences. Bahr (2019) also analyzed earnings gains among CTE participants in California and found that in addition to strong economic outcomes for students who earned degrees in Health Sciences, students who took coursework in high-demand fields including Business & Management, Engineering & Industrial Technologies, Information Technology, and Public & Protective Services experienced significant earnings gains, whether or not they earned an award.
All three public higher education segments in California display workforce data in public dashboards. In the Community College LaunchBoard, several dashboards display rates of employment, median earnings, earnings gains, and living wage attainment one year after leaving college, whether or not students earned an award. Information is available by program of study and for adult education students, disaggregated by student characteristics and completion status. In addition, Salary Surfer lists the average earnings of California community college graduates by academic program, including earnings two years before, and two and five years after completing, paired with videos showcasing the characteristics of specific programs. The California State University Data Insights Center displays early and mid-career earnings for graduates across all majors, as well as the proportion of graduates in high-demand fields. The University of California Infocenter provides a comprehensive breakdown of the earnings of its graduates, disaggregated by campus, discipline, and major after two, five, and ten years. It also provides comparisons to students who attended other four-year postsecondary institutions in California (see Figure 6 on the next page).

While the existing postsecondary workforce data visualization tools in California offer much-needed insights for policymakers and other key stakeholders, a state data system would amplify the ability of this information to inform practice. For example, the state data system could help aggregate information in a central location and extend it to include private and independent colleges and students who do not attend a postsecondary institution. Using a consistent methodology and level of detail would also make it easier for parents, students, and policymakers to access and compare information.

Furthermore, the state data system would allow for deeper research into areas such as equitable outcomes and social mobility. For example, while research consistently finds that increased educational attainment is associated with higher earnings, women continue to earn less than men despite educational gains (Carnevale et al., 2018). Researchers could extend this analysis to examine the nexus of gender, race, and program of study to identify interventions that could address systemic bias and support students in pursuing non-traditional careers. The data system could also be used to

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27 See the California Community College Launchboard Dashboards here: https://www.calpassplus.org/LaunchBoard/Home.aspx
29 See the CSU Data Insights Center here: https://www2.calstate.edu/data-center/
explore differential effects of educational attainment by region and identify which institutions are most effective at helping students move to a higher income bracket.

Figure 6: University of California Alumni at Work Dashboard

Preparing for the Subcommittee Meeting

At the June 2020 Cradle-to-Career Workgroup meeting, the partner entities voted to expand the vision for the data system to include information on skills training, including short-term programs that retrain unemployed workers and apprenticeship programs that enable students to prepare for high-demand, high-pay occupations. While these

30 See the UC Alumni at Work visualization here: https://www.universityofcalifornia.edu/infocenter/uc-alumni-work
data points would not be included in the public dashboards and query tools in the first phase, research studies could shed insight into a broader range of skills training programs and integrate labor market information to better understand how employment has been changed by the COVID-19 pandemic. See the callout box below for a list of other research questions suggested by partner entities, advisory groups, and advocates that could be included in the research agenda.

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**Potential Research Questions**

California education stakeholders have identified the following questions related to the workforce effect of graduation from high school, community college, and four-year postsecondary institutions:

- What are the workforce outcomes of California students who do not graduate high school?
- What are the job placement rates and wages among California high school graduates who do not attend college?
- What kinds of careers do California students have, and what are their pathways to getting there?
- What is the education premium and how does it differ among different groups of students?
- What are the salary and employment differences for students with varying levels of education attainment? How do salary and employment data vary by major area of study?
References


