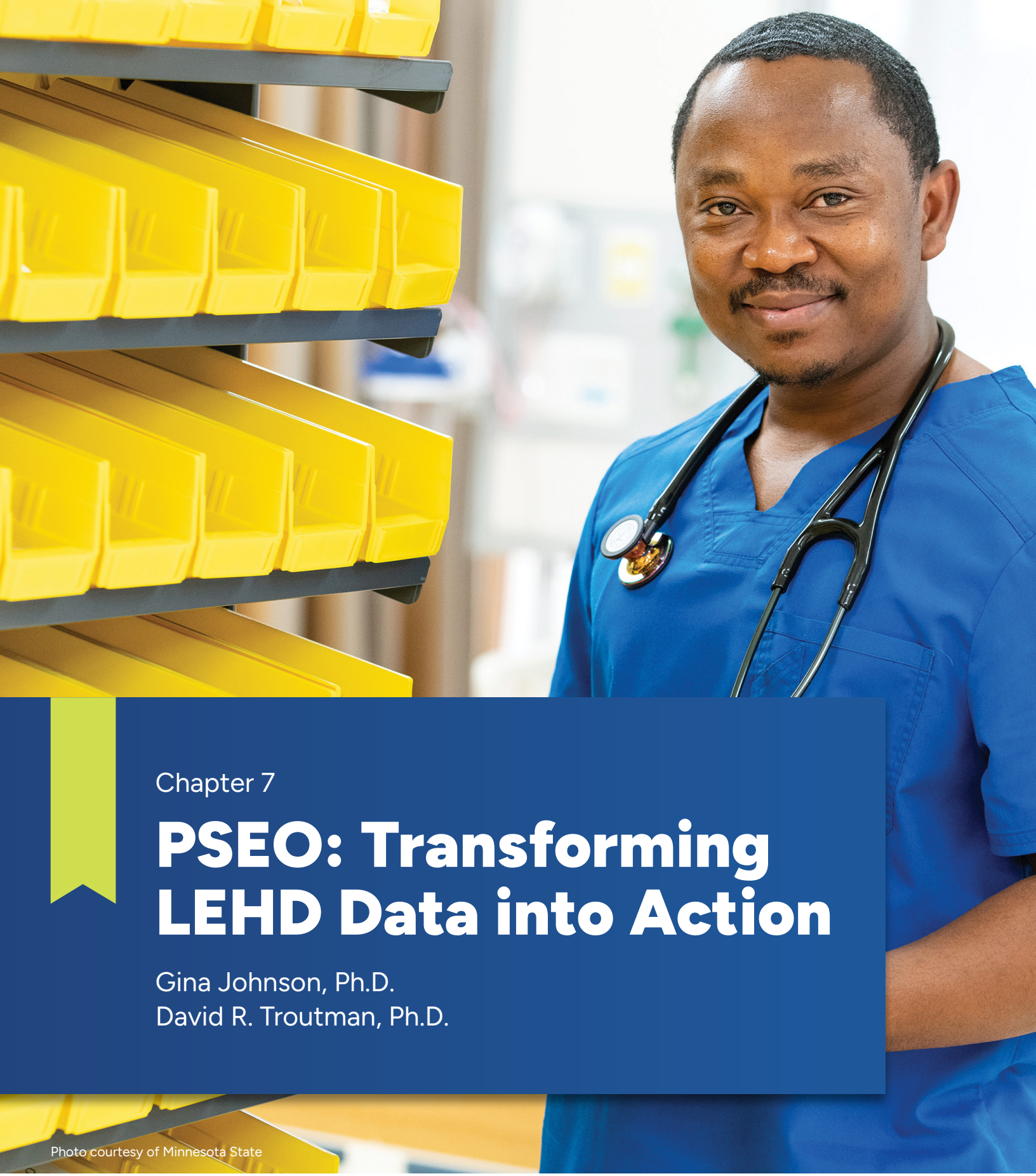

Chapter 7

PSEO: Transforming LEHD Data into Action

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Photo courtesy of Minnesota State

PSEO COALITION

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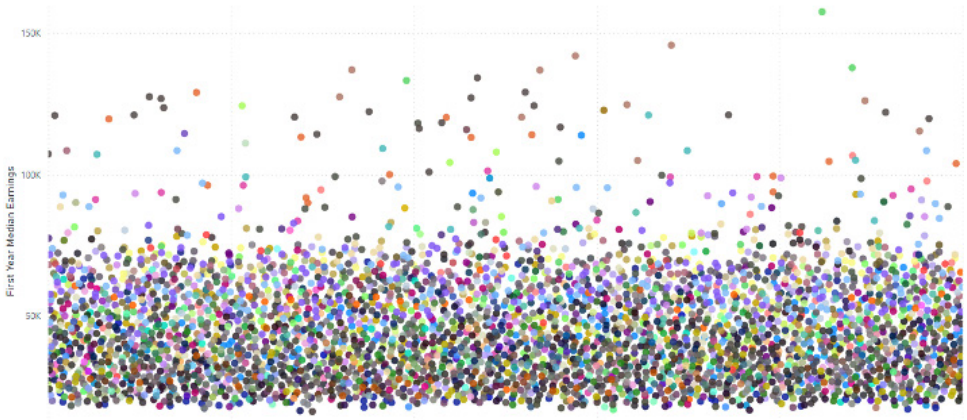
PSEO: Transforming LEHD Data into Action

Introduction

The Postsecondary Employment Outcomes (PSEO) Explorer was developed by the U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) division at the U.S. Census for individuals to easily navigate the earnings outcomes from students receiving credentials from 823 institutions from among 27 states participating in the PSEO Coalition. Based on IPEDS 2020 data, the PSEO tool accounts for more than 6.63 million students enrolled in the fall of 2020. As you begin to use the tool, you quickly realize the unlimited options you have at your fingertips when exploring student earning outcomes and what industries they are employed in after graduating.

The data feeding the tool is based on students' credentials at the 2-digit or 4-digit Classification of Instructional Programs (CIP) within a 3-year or 5-year graduating panel. The PSEO Explorer accounts for almost 225,000 instructional program combinations across all degree types for PSEO Coalition cohorts from 2001 to 2018. To illustrate this, each dot within Figure 1 is an instructional program tied to first-year earnings outcomes. The color of the dot is one of the many 2- or 4-digit CIPs (e.g., Engineering and Biochemical Engineering, respectively).

Figure 1. First-Year Median Earnings Across All Instructional Programs



In addition to the PSEO Explorer, the LEHD program includes the ability to download the entire data set on which the tool runs. Downloading this data allows researchers to explore the data differently. While the PSEO Explorer does not provide Figure 1 as a visualization in the tool, it is critical to understand the multiple layers of data when you download the aggregated data tables from the public website. The PSEO dataset provides a myriad of opportunities to better understand the earnings and employment outcomes of the graduates represented in the data.

In this paper, the researchers provide the following:

1. The Connective Data and Dashboard Strategy (CDDS) is a user-centric framework designed for dashboard navigation. It guides individuals when framing problem statements (i.e., research questions) while exploring complex dashboards (e.g., PSEO Explorer). When examining the underlying data used to fuel the tool, the CDDS will facilitate problem-solving and the creation of action plans.
2. Trend analysis of all participating PSEO Coalition states to identify the highest earnings for students receiving a bachelor's degree at the 4-digit CIP for each state.
3. Statistical analysis into the dataset to identify institutional areas of study with unusually high earnings compared to the ranges within an instructional program, reflecting on what information can be gleaned from reviewing the flow data of these institutional areas of study.
4. List of data analytical questions to ask yourself when using the PSEO Explorer and conducting research using the downloadable PSEO data.

Connective Data and Dashboard Strategy

In the past decade, there has been an exponential rate at which higher education collects and manages higher education data. This has happened so quickly in higher education that there is a persistent expectation and pressure that all higher education professionals should have enhanced data acumen or data science mindset to help them support their jobs and institutions. In addition, higher education went from using Microsoft Excel to produce tables and static reports to using interactive dashboards overnight. With this culture shift, there needed to be more time for individuals in higher education to develop a strategy to effectively use dashboards to create action plans based on their findings. The Connective Data and Dashboard Strategy (Figure 2) gives higher education professionals four steps (1. Formulating Problem Statement, 2. Diving Deep into the Data, 3. Connecting the Dots, and 4. Developing Action Plans) they can use to create action when interacting with data and dashboards.

Step 1: Formulating a Problem Statement

The quote "If you build it, he will come" was made famous from the movie Field of Dreams. The quote captures the spirit of higher education's effort to create thousands of dashboards on a variety of higher education topics. And while "he" (i.e., higher education professionals) came and interacted with dashboards, were those dashboard visitors satisfied with their experience, and were they ready to interact with filters, drills-down graphs, and multiple visualizations to glean insight that could have position them to create strategic moves to resolve the problem? Not all dashboards provide visitors with a "Field of Dreams" experience. The opposite can happen. Visitors might quickly become frustrated with their experience.

To reduce your frustration when engaging with data or dashboards, you must already have established problem statements or research questions. This step is essential. Data and dashboards do not have an "easy button," nor do they usually have one metric that stands out from the rest to resolve your problem statement or answer your research question. A clear and concise problem statement will help determine if data and dashboards will assist you in your journey.

Step 2: Diving Deep into the Data

When taking a deep dive into the data, you must familiarize yourself with the data documentation associated with the dashboard. You need to identify the strengths and weaknesses of the variables used on the dashboard. Ask yourself: How is the data collected? How often is the data and dashboard updated? What is the unit of analysis based on the metrics displayed on the dashboard? Is the data aggregated (e.g., cohort panel, year, program of study)?

After becoming familiar with the data, explore the various dashboard tabs and filters. Once you have a feel for the dashboard, we encourage you to keep a journal beside your mouse pad to log all your observations during your data or dashboard exploration. You will be surprised how quickly your journal will fill up with lines to findings. The problem statement should be used as your north star to guide you through your dashboard journey.

You will sometimes need to go back to step one and reformulate your problem statement or research question based on what you have observed during stage 2. As you explore, you will identify data and dashboard blind spots. These blind spots highlight the limitations of the current data ecosystem feeding the dashboard. In your journal, you should also provide a space for a "parking lot." A parking lot can store any findings you thought were interesting but not associated with your problem statement. The parking lot should be addressed later based on your time availability and resources.

Step 3: Connecting the Dots

Themes based on the list of findings you listed will begin to appear. Based on these themes, you can develop and outline strategic approaches for addressing the issues associated with the problem statement.

Step 4: Transforming Data into Action Plans

Place strategies into a sequenced series of short-term action plans (i.e., 90 days). Creating short-term plans will be critical for ensuring your strategies are successfully implemented. Six-month or one-year action plans create a greater risk of failure. There are two components of your action plan. One section of your plan will be based on detailing the required activities, responsible parties, and deadlines to ensure you are resolving the problem statement. The second section of your action plan is a list of stakeholders who should be informed based on any of your strategies they might encounter at an institution.

Communication Strategies with Stakeholders

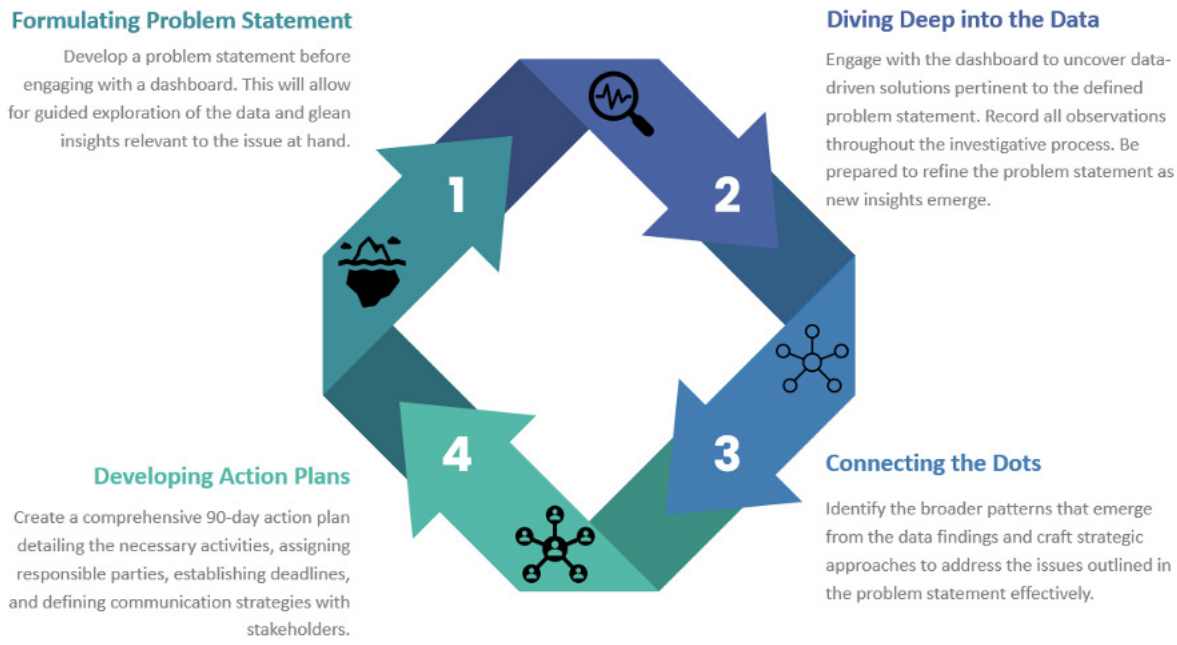
The PSEO Explorer is a valuable tool for stakeholders to obtain data-informed insights into various questions. Examples include:

- *Students and families can explore potential earnings, industries that employ graduates with various areas of study, and job prospects in different geographic areas represented in the data. This information can help them explore and compare outcomes of different areas of study and different institutions that offer those programs.*
- Faculty members can explore the industries hiring graduates of their programs and the earnings connected to those jobs. This information can help them determine where to explore industry connections with their institutions and programs. It can also help them advise students on career paths in their program.
- *Institutional personnel in advising, career counseling, and student affairs* can also explore the industries hiring graduates of institutional programs and the earnings connected to those jobs. This information can help them advise students on their career options and highlight potential areas of opportunity for recruitment collaboration with industry representatives.
- *Institutional presidents and chancellors* can explore earnings and employment outcomes of the areas of study at their institution. This information can help them better understand the local and regional impacts of their institution's outcomes, identify areas of study where earnings are lower, but social impacts are high to determine whether student support may be necessary, and gain insights on how their institution fits into statewide impacts of the postsecondary sector.
- *Institutional communicators and external relations professionals* can also explore earnings and employment outcomes of the areas of study at their institution. This information can help them more accurately tell a data-informed story about the effects of the institution on regional and state impacts of graduates and develop relationships with industries and employers that hire graduates from the institution, marketing the institution and its successes to prospective students, employers, and community members.

Trend Analysis Across All PSEO Coalition States

Problem statement: Public perceptions and media have continued to question the value of higher education. While some students are not reaping the economic benefits of higher education, others are.

Figure 2. Connective Data and Dashboard Strategy



To address this, we will examine the PSEO earnings data to determine the highest first-year median earnings by the 4-digit CIP for each state participating in the PSEO Coalition. We will explore to determine if there are variations in earnings outcomes by specific programs of study.

Diving Deep into the Data: Before exploring the PSEO Explorer, time was spent becoming familiar with the data by reading about the PSEO Methodology and Data Sources and PSEO Technical Documentation. We determined several limitations preventing us from fully explaining possible earnings differences. For example, within the PSEO Explorer, data is not disaggregated by race/ethnicity, gender, age, or family income. Without that information, there are limitations on how the findings can be interpreted. Additional limitations include blind spots associated with the number of jobs graduates have after receiving a credential (e.g., several graduates might have concurrent jobs within a given year, which might inflate the earnings outcomes. As well as not knowing if graduates continue their education and have received additional credentials. For example, students with bachelor's degrees in Philosophy might receive a JD (Juris Doctor, law degree) later. Both types of students are reported in bachelor's degree in Philosophy earnings outcomes.

The PSEO Explorer could assist in answering this question, but it is much faster to download the data from Download Public-Use Data and import it into Microsoft PowerBI. Downloading the data

gives researchers more agility and flexibility to answer research questions. The U.S. Census American Community Survey (ACS) 5-year estimates for income in the past 12 months (2020 inflation-adjusted dollars) were used to help provide additional context based on the earnings outcomes. This data can be found on the U.S. Census Bureau Profiles website.

Based on the problem statement, we placed parameters on which graduate outcomes would be explored. Only individuals receiving a bachelor's degree from 2016 to 2018 were included in this analysis. Placing parameters around the data reduced the degrees within the data set from 97,800 bachelor's degrees to 15,600. Using Microsoft PowerBI enabled the ability to design various graphs and maps to identify findings. In Figure 2, the map provides the highest first-year earnings (bachelor's) by state and program of study for the 2016-2018 cohort. The earnings are inflation-adjusted to 2020 dollars.

There are four states (Colorado, Montana, Oklahoma, and Missouri) where Petroleum Engineering is the highest paid one year after receiving the credential. These first-year median earnings ranged from $73,000 to $83,000. There were five states (Georgia, Michigan, Pennsylvania, Texas, and Virginia) where Computer and Information Sciences, General (i.e., 4-digit CIP label), had the highest paid credential. These first-year median earnings range from $82,000 to $103,000. Fire Protection was the top earning credential for four states (Ohio, Oregon, Massachusetts, and Wisconsin). First-year median earnings ranged from $81,000 to $118,000. Registered Nursing, Nursing Administration, Nursing Research, and Clinical Nursing was the top earning credential for two states (Minnesota and New York), with first-year median earnings at $87,000 and $108,000, respectively. Electrical, Electronics, and Communications Engineering was the highest-paid program of study for three states (Iowa, Maine, and South Carolina). All three states had similar first-year median earnings at around $71,000.

Connecting the Dots

Specific themes are identified when examining all the findings found during the deep dive activity phase. There are dramatic differences in first-year earnings outcomes for the same program of study by state. There is a $20,000 earnings disparity for graduates receiving a Computer and Information Science bachelor's degree when living in Pennsylvania versus Virginia. Geographically, these two states are not far from each other. However, understanding graduate migration patterns and cost of living differences based on the metropolitan area might begin to help explain this earnings difference. Due to the limitations of the data, we cannot determine the differences in earnings by race/ethnicity, gender, age, or family income status.

What was most surprising from the analysis was that the fire protection credential received the highest earnings (e.g., more than $110,000) of all bachelor's degrees for the 2016-2018 cohort. There was an assumption that the Petroleum Engineering program of study would take the top spot. Focusing on Fire Protection, this program had the highest rate of first-year median earnings. However, there is almost a $38,000 difference in first-year earnings when receiving the degree in Oregon ($118,889) versus Wisconsin ($81,086). Based on the limitations of the data, it is difficult to determine what is happening.

Is it a cost-of-living issue? Is there a difference in the type of students receiving the degree at specific institutions within each state? Further analyses are needed to answer these questions.

There was also a stark difference (e.g., $20,000) in first-year earnings for Registered Nursing, Nursing Administration, Nursing Research, and Clinical Nursing in New York versus Minnesota. Once again, we ask: is that due to the cost-of-living differences, is it the type of specialized skills students are receiving within the four-digit CIP at specific institutions or both? The Department of Education's CIP codes are beneficial for comparing programs of study across 1,000 institutions. However, we must acknowledge the limitations of using the four-digit CIP aggregations. Further studies are needed to understand the portfolio of skills and student learning outcomes that might differ when comparing Registered Nursing, Nursing Administration, Nursing Research, and Clinical Nursing in New York versus Minnesota.

Graduates receiving a bachelor's degree in Electrical, Electronics, and Communications Engineering did not experience differences in first-year median earnings based on the students' location where they received their credentials. It did not make a difference if you lived in the Midwest (Iowa), Northeast (Maine), and South (South Carolina). Graduates from this program of study had very similar earnings, ranging from $71,133 to $71,780. It might be the case that these locations had similar cost-of-living expenses. However, further research is needed to determine the similarities.

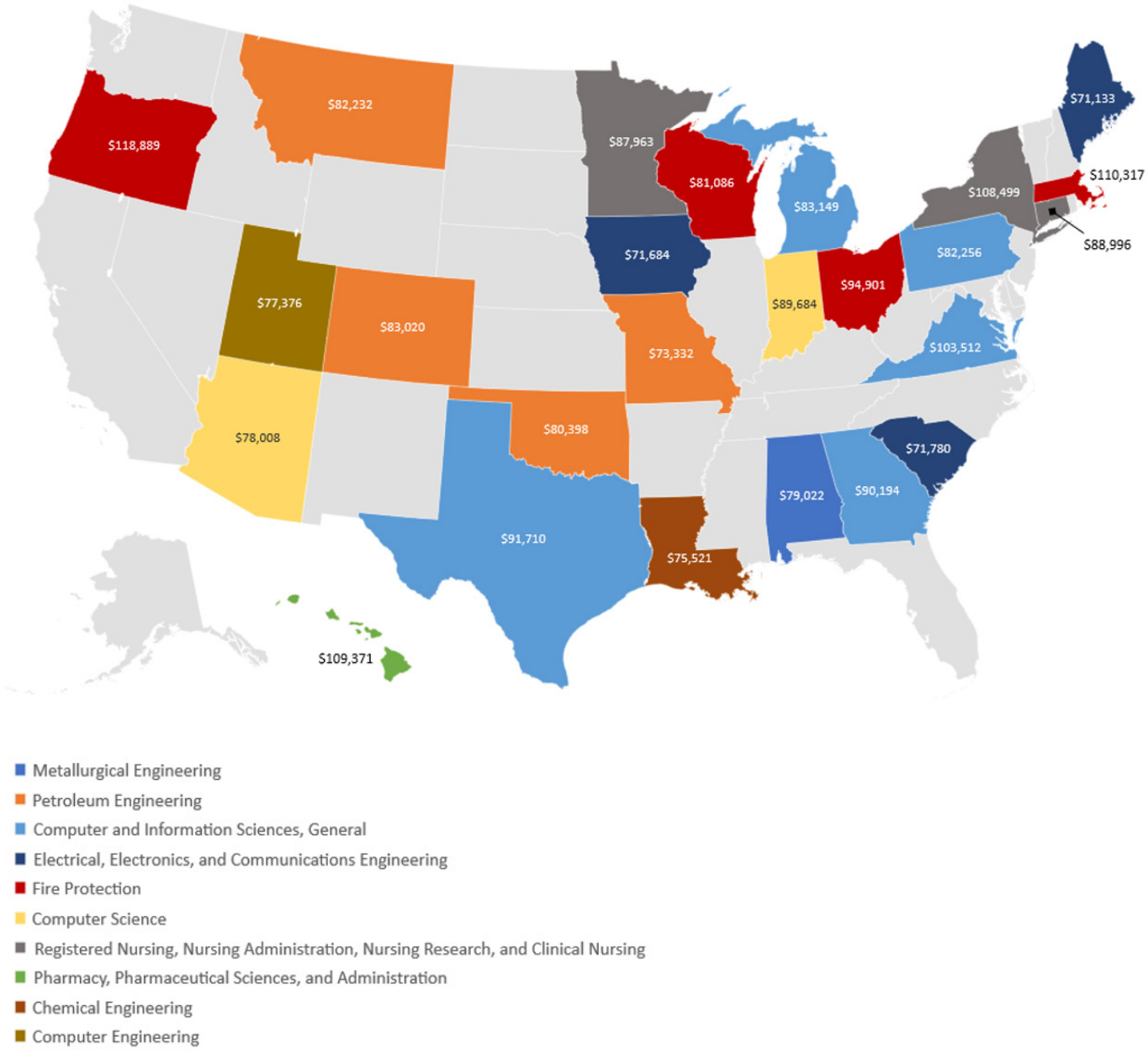
Reflecting on the problem statement, do any of the themes from the findings assist in resolving the negative public perceptions of the value of a college degree? All the top programs of study identified on the Figure 2 map highlight the economic benefits of receiving a college degree. Based on the U.S. Census ACS five-year estimates for income in the past 12 months, the median earnings for single individuals (i.e., nonfamily households) in the U.S. is $39,000. The programs listed previously earn more than double and sometimes triple what single individuals in the U.S. make annually. When looking at the overall distribution of income using ACS, graduates who make more than $75,000 a year find themselves in the top 25 percent of earners in the U.S. Based on this same data, graduates who make at least $50,000 make more than 40% of all single individuals in the U.S.

Developing Action Plans

So, how do we make this data more actionable to help resolve our problem statement? The answer is by beveloping a communication strategy to highlight existing earnings differences and the benefits of receiving a higher education credential. The earnings outcomes will be the central talking point for the communication strategy. However, additional information like average student loan debt, the accumulative net cost of attendance, and opportunity costs (e.g., foregone earnings) associated with the program of study must accompany the earnings outcomes information. It is useful to establish and distribute one-page information sheets per program of study for parents and students, higher education professionals (academic advisors and career advisors), elected officials, and reporters of higher education media outlets.

Further studies are needed to explore the PSEO data to determine the value of higher education credentials. Future modifications and enhancements to the PSEO data are needed to create full transparency and clear outcomes for various higher education stakeholders. Additional research efforts are needed to accurately identify cost-of-living estimates (e.g., MIT Living Wage) so that earnings can be placed in context for where students live after receiving a credential.

Figure 3. Top First Year Earnings (Bachelors) by State and Program of Study for the 2016-2018 Cohort



Data Highlights from Statistical Analysis

As previously outlined, the PSEO Explorer can be used in multiple ways, depending on the user's characteristics and interests in the data. The authors of this paper used the tool to identify some diamonds (i.e., unique areas of study that stand out) in the data. That is, institutional areas of study that deliver unexpectedly high earnings one year post-graduation. As an initial exploration, the 2-digit CIP codes with the largest number of institutions represented in the dataset were analyzed, and salary data at the 50th percentile one, fave, and ten-years post-graduation were reviewed. To highlight an array of findings, the authors highlighted diamonds representing various states within the PSEO dataset. This data exploration exercise was designed to highlight unexpected findings that prompt questions for the researchers to consider when generating conclusions from the dataset. Following is a summary of findings from this data exploration, beginning with an overview of the four-step process of effective use of complex dashboards.

Problem Statement: There is concern that too much focus is placed on financial outcomes when measuring the value of a postsecondary education. The PSEO Explorer does include financial earnings. It also provides information on the categories of employment secured by the graduates represented in the dataset. In addition to financial outcomes, what information can be gleaned from considering the two types of data, earnings, and flow contained in the tool? And what factors contribute to these high-earning degrees?

Diving Deep into the Data: Using IBM's SPSS Statistics software and the downloaded dataset, the above analysis was conducted to identify areas of study classified by 2-digit CIP codes with the highest earnings as an initial exploration of outcomes. After identifying the high-earning areas of study, described below, the researcher returned to the PSEO Explorer to review the flow of information. This deep dive using the downloaded dataset and the tool allowed the researcher to better understand the connections between the earnings and flow data.

Connecting the Dots: It took a back-and-forth analysis between the dataset and PSEO Explorer to connect some dots in understanding why areas of study at particular institutions result in higher-than-average earnings, as highlighted in the descriptions below. Cost of living, employment type, institution location and type, and uniqueness of program are all factors that may contribute to earnings.

Developing Action Plans: As with much research, not all dots were connected in this analysis. The researcher was left with further questions about the factors related to high-earning programs. Initial searches on institutional websites uncovered additional information, but there is much more to explore. In the case of this analysis using the PSEO Explorer, the action plan developed is a plan for further research. A qualitative research plan is being developed to expand on the initial problem statement of understanding the factors contributing to high-earning degrees.

Hawaii Community College (2 campuses on the island of Hawaii)

Associates in Health Professions and Related Programs (CIP 51)

The areas of study represented by CIP code 51 at Hawaii Community College includes Registered Nursing, Nursing Administration, Nursing Research and Clinical Nursing. 1-year post-graduation earnings at the 50th percentile is $70,701, compared to the mean of $49,225 (replace this with the range). In reviewing the flow of these graduates 1-year post-graduation, the vast majority (79%) are employed in Health Care and Social Assistance, with the next highest (8%) in Public Administration
Earnings continue to rise to $87,701 at the 50th percentile five years post-graduation and $102,704 at the 50th percentile ten years post-graduation, keeping Hawaii Community College graduates near the top compared to other institutions. The flow for graduates shows primary employment in Health Care and Social Assistance 5-years (76%) and 10-years (78%) post-graduation. While the dataset does not include the location of the graduates, the cost of living is likely a factor in the salaries of those graduates that remain in Hawaii, with the state recording the highest cost of living in the third quarter of 2023, according to the Missouri Economic Research and Information Center (MERIC).

University of Massachusetts - Lowell

Associates in Computer and Information Sciences and Support Services (CIP 11)

One-year post-graduation earnings at the 50th percentile is $79,397, compared to the mean of $35,560. Unsurprisingly, given the many areas of employment open to graduates of computer and information sciences programs, there is great variety in the flow of their employment. 26% are employed in Professional, Scientific, and Technical Services, 14% in Manufacturing, 13% in Information, and 15 other employment categories are represented at 7% or less.
Earnings continue to rise to $92,092 at the 50th percentile five years post-graduation, keeping the graduates of this program at the top in earnings. Data for ten years post-graduation is not available in the dataset.

Minnesota West Community and Technical College (Worthington, MN)

Associates in Agricultural/Animal/Plant/Veterinary Science and Related Fields (CIP 1)

Detailed information for the areas of study represented by CIP code 1 at Minnesota West Community and Technical College is not available in the PSEO Explorer. One year post-graduation earnings at the 50th percentile is $49,145, compared to the mean of $30,274. In reviewing the flow of these graduates one year post-graduation, 31% are employed in Manufacturing, 27% in Wholesale Trade, 12% in Retail Trade, and the rest in an additional ten employment categories.

Earnings continue to rise to $57,464 at the 50th percentile five years post-graduation and $68,541 at the 50th percentile ten years post-graduation, keeping these graduates near the top compared to other institutions. Cost of living is unlikely to be a factor in the higher earnings of these graduates, with the institution located in rural, southwestern Minnesota, close to the borders of Iowa and South Dakota. Given this location amid farming and ranching areas of three states, there is likely plenty of need for this area of expertise.

Georgia Institute of Technology

Bachelors in Visual and Performing Arts (CIP 50)

In the Design and Applied Arts field, as classified under CIP code 50, the Georgia Institute of Technology showcases noteworthy post-graduation earnings outcomes. Graduates in this area report a median earning of $44,582 one year after graduation. To put this in perspective, comparing these figures with the broader spectrum of earnings in the field is insightful. Specifically, in a pool of 355 Visual and Performing Arts programs analyzed by the PSEO Coalition, the 25th percentile earnings stand at $20,011, indicating that a quarter of graduates earn this amount or less. More impressively, Georgia Tech's median surpasses the 75th percentile benchmark of $36,583, a figure that three-quarters of graduates in the broader field do not exceed. In reviewing the flow of these graduates 1-year post-graduation, 28% are employed in Professional, Scientific, and Technical Services, 18% in Manufacturing, 11% in Wholesale Trade, and the rest in an additional 14 employment categories.

Earnings continue to rise to $64,000 at the 50th percentile five years post-graduation and $80,987 ten years post-graduation, keeping the graduates of this program at the top in earnings. The specific focus area of Design and Applied Arts, makes the Georgia Institute of Technology Visual and Performing Arts majors somewhat unique compared to all the other focus areas represented in CIP code 50. This and the flow of employment, highlighted above, may explain the higher earnings.

New York City College of Technology of the City University of New York

Bachelors in Education (CIP 13)

The area of study represented by CIP code 13 at New York City College of Technology of the City University of New York is Teacher Education and Professional Development, Specific Subject Areas. The degree focuses on Mathematics Education, Technology Education, and Career and Technology Education. One-year post-graduation earnings at the 50th percentile is $78,186, compared to median earnings for 307 Education programs in the PSEO Coalition. For the 25th and 75th percentile, it is $25,000. In reviewing the flow of these graduates one year post-graduation, 33% are employed in Educational Services, 27% in Public Administration, 12% in Accommodation and Food Services, 10% in Retail Trade, and the rest in an additional ten employment categories.

Earnings continue to rise to $106,567 at the 50th percentile five years post-graduation and $117,136 ten years post-graduation, keeping the graduates of this program at the top in earnings. Cost of living is likely a factor in these higher earnings, given New York City's comparatively high costs compared to the rest of the nation. Interestingly, though the major specifically prepares graduates for work as middle and high school teachers, only one-third are employed as teachers one-year post-graduation. 47% are employed in Educational Services and 38% in Public Administration five years post-graduation, perhaps indicating that these graduates are leaving a field to become teachers. Given the flow data showing eighteen different employment categories for graduates ten years post-graduation, with only 29% employed in Educational Services, it is difficult to assess.

Eastern Oregon University

Bachelors in Homeland Security, Law Enforcement, Firefighting and Related Protective Services (CIP 43)

Oneyear post-graduation earnings at the 50th percentile is $117,658, compared to the mean of $34,573, a notable difference. In reviewing the flow of these graduates 1-year post-graduation, 90% are employed in Public Administration. The remaining 10% are employed in an additional six employment categories. The large proportion of graduates employed in Public Administration remains consistent both five years and ten years post-graduation. A search of the Eastern Oregon University website reveals that "EOU is the only school on the West Coast offering a degree in emergency medical services administration that meets standards set by the National Fire Academy," which may explain the flow of graduates into Public Administration. The degree is available online, maximizes students' certifications, and allows credit for prior field experience.

Earnings for Eastern Oregon University continue to top the list for CIP code 43. However, they go from $126,486 five years post-graduation to $123,045 ten years post-graduation, a slight drop in earnings, which may be accounted for by the fact that the number of graduates represented in the ten year post-graduation data is one-third those of the one year and five year post-graduation data.

Colorado School of Mines

Bachelors in Mathematics and Statistics (CIP 27)

One year post-graduation earnings at the 50th percentile is $60,791, compared to the mean of $41,475. In reviewing the flow of these graduates one year post-graduation, 46% are employed in Professional, Scientific, and Technical Services, 14% in Manufacturing, 11% in Information, and the rest in an additional 13 employment categories. These employment category percentages remain relatively consistent in both five years and ten years post-graduation.

Earnings continue to rise to $89,145 at the 50th percentile five years post-graduation and $111,251 ten years post-graduation, keeping these graduates near the top compared to graduates from other institutions. Given Colorado School of Mines' focus on applied science and engineering, its graduates in mathematics and statistics may enter employment with a mining, manufacturing, and engineering focus due to the school's connections with these types of employers.

Questions to Ask When Using the PSEO Data for Research

The data exploration outlined above reinforced that the PSEO Explorer is only one piece of the puzzle in understanding postsecondary outcomes, though it is a large piece. The tool allows users to explore a large set of earnings and employment data previously unavailable to lay users. It allowed these researchers to identify interesting findings and uncover questions that should be explored further. What follows is a summary of some of the questions we believe PSEO Explorer users should ask themselves when using the tool and analyzing its data.

What level of CIP code is most meaningful for my research?

It is generally the case that two-digit CIP codes have the largest number of cases represented in the dataset, both by institution and by number of graduates within those institutions. Therefore, if sample size is important to the research, it may be advisable to use data at this level. However, as outlined above in some examples, comparing institutional programs at that level regarding expected earnings can be misleading. As with the Eastern Oregon University example above, programs focused on leadership positions would have different earnings outcomes than those focused on entry-level positions. However, it is still notable when programs like these have successful earnings outcomes. In this case, the earnings data highlights a unique program of value to its graduates that may exist in only one place.

What other factors might play into the earnings?

- What was the previous experience of the graduate before entering the program?
- What degrees were earned by graduates beyond the degree represented in the data?
- What is the cost-of-living variation across the country?
- What is the industry field of employment?

As with most research projects, exploring the earnings data in the PSEO Explorer leads to more questions. This fact highlights the usefulness of this tool as a way to explore the data and identify institutions and programs of interest. It also highlights the need to learn more about the institutions and programs of interest. The questions above represent some of the ways in which the findings from an exploration of the earnings data could be further interrogated. A researcher can use the tool, as these researchers did, to identify interesting findings and then use qualitative research to understand the nuances of the earnings data further.

What other factors might influence graduates' flow into employment fields?

- What are the relationships between institutions and employers?
- What were the degrees earned by graduates beyond the degree represented in the data?
- What is the availability of employment in the area of study near the student?

Similar to the earnings data factors, exploration of the PSEO Explorer flow data leads to additional questions like those listed above. Flow factors may be related to the individual graduate, such as degrees earned after the one represented in the data that lead to a different career path five and ten years after graduation. They may also be related to the institution's characteristics, such as whether the institution is located near particular types of employers and if the institution has a special relationship with those employers that leads its graduates to increased employment there.

How can I use the earnings and flow data together in my research?

Both the earnings and flow data are interesting by themselves, but when combined, they provide a richer picture of the information contained within the PSEO Explorer. In the Data Highlights section of this paper, the researchers used the earnings data to identify institutions and programs of interest. The quantitative nature of that data made it a natural fit for identifying outliers. However, to better understand the earnings data, reviewing the flow data for each program was necessary. For example, the New York City College of Technology of the City University of New York's Education graduate earnings information was intriguing, particularly after learning from the institution's website that the program focused on only three licensure areas for teachers. The cost of living is undoubtedly a factor in New York City, but would that explain the high earnings on its own? The flow data allowed the researchers to see that most graduates did not appear to be employed in teaching, as might be expected of a program focused on teacher licensure. The story is nuanced and leaves the researchers with more questions to be explored. The earnings data is the tool for identification; the flow data adds nuance, and, to truly understand the earnings and flow of a program, more qualitative research is needed.

Conclusion

The trend and statistical analysis findings highlight the variations in student earnings outcomes within specific programs of study and the earnings differences across numerous institutions offering the same program of study. Several factors influence these earnings variations, and higher education professionals must consider them when exploring the PSEO Explorer dashboard and downloading and analyzing the PSEO data (e.g., earnings and job flows).

The CDDS can positively impact how higher education professionals interact with data and dashboards to solve problems. Following each step of the strategy will ensure your problem statements are more attuned with data points instead of gut feeling/instinct. Do not get me wrong; gut feeling/instinct can serve us positively. However, when answering questions and resolving problem statements on the "value of higher education," data and dashboards will be your best guide. You must get to know the data within dashboards before you begin exploring the dashboard, which will save you time and energy. You might find that the dashboard you are looking at might not have the data you need to solve your problem statement. Conversely, increased data literacy will help you navigate complex dashboards once you are familiar with the data.

During your dashboard exploration, maintain a log of your findings so you can connect them to glean new data-based insights. These insights will enable you to identify strategies to tackle your problem statement. Placing the new strategies into a short-term action plan will help you successfully implement your strategies. The action plan will help you effectively communicate with the key stakeholders who can assist you in ensuring that your action plan creates action.

The PSEO Explorer tool is one piece of the research puzzle – a big piece that higher education professionals have sought after for decades. Stakeholders can use the tool as is or download and explore the data using data visualization or analysis tools. Interrogating the data leads to enhanced questions and ideas for resolving problems in higher education. We are confident that these enhancements will lead to resolving problem statements and research questions about the value of higher education.