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FULL REPORT N^o. 3:

Work-Based Learning in Pennsylvania:

Mapping CTE WBL Opportunities and Participant Characteristics by Local Education Agency (LEA) and Region

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Pennsylvania Department of Education

Office of Administration

This report is the third in a series of research related to work-based learning (WBL) in Pennsylvania (PA) secondary schools. This report provides a statewide perspective on regional differences in WBL participation for two cohorts of recent PA high school graduates. Maps detail the local education agencies (LEAs) attended by Career and Technical Education (CTE) students in these cohorts, rates of participation in specific WBL opportunities, and the characteristics of students who participated.



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ABSTRACT:

A visual companion to previous reports in this series on work-based learning (WBL), the current report highlights differences in WBL participation by local education agency (LEA) and region among secondary Career and Technical Education (CTE) students in Pennsylvania. Descriptive data for two cohorts of secondary CTE students from the graduating classes of 2019 ($N = 22,412$) and 2020 ($N = 22,501$) were aggregated to the LEA and geographical region associated with their CTE program and mapped in Tableau software. Results indicate that cohort students enrolled in programs at 182 public-school districts/career and technical centers in PA. Among these LEAs, 162 enrolled at least one student who participated in a WBL opportunity. As a proportion of total CTE enrollments in the region, students in the Central/North Central region of PA had the highest rate of participation in WBL (44.2%) while students in the Southeast region had the lowest (25.9%). Meanwhile, the number of LEAs with at least one WBL participant differed notably across PA regions and by WBL opportunity. One hundred percent of the LEAs attended by cohort graduates in the Southeast region ($n = 20$) enrolled at least one WBL participant, compared to 82.3% of LEAs in South Central PA. Finally, WBL participant characteristics were explored across regions, showing differences in the proportion of WBL participants with IEPs, economic disadvantage, and participants of color. Students of color were most represented among WBL populations in the Northeast (34.5%) and Southeast PA regions (47.2%), while Black students were most represented among WBL participants in the Southeast (25.9%) and Southwest (13.4%) corners of the state. More generally, higher demographic representation among WBL participants was aligned with higher demographic representation among the overall CTE population in a region. These results highlight geographical differences in WBL participation across PA secondary schools, contextualizing previously reported statewide participation rates in WBL opportunities and the characteristics of students who take them.

KEY FINDINGS:

- Cohort students were enrolled in CTE programs at 182 public-school districts/career and technical centers in PA. Among these LEAs, 162 enrolled at least one student who participated in a WBL opportunity.
- As a proportion of total CTE enrollments in the region, students in the Central/North Central region of PA had the highest rate of participation in WBL (44.2%) while students in the Southeast region had the lowest (25.9%).
- One hundred percent of the LEAs attended by cohort graduates in the Southeast region ($n = 20$) enrolled at least one WBL participant, compared to 82.3% of LEAs in South Central PA.
- The percentage of LEAs with at least one agriculture experience participant was higher in the two central regions of PA, but lower in the east and west. Rates were especially low in the Northeast region, where CTE students in the combined cohort participated in agriculture experiences at only 5.9% (1 out of 17) of the LEAs they attended.
- The Southeast region had the highest percentage of LEAs which taught one or more internship participants from the present cohorts (55%), while the Northwest region had the lowest percentage (13.6%).
- A greater proportion of LEAs in the Southwest region (44.4%) enrolled at least one job exploration participant compared to other regions of the state, especially the Northwest region (13.6%).
- Generally, higher demographic representation among WBL participants was aligned with higher demographic representation among the overall CTE population in a region.
- Nearly half (47.2%) of all WBL participants in the Southeast region were students of color, compared to only 4.8% in the Northwest region.
- WBL participants in the Northwest, Southeast, and Southwest territories experienced economic disadvantage at rates above the statewide average for WBL participants.
- WBL participants in the Central/North Central region had notably lower than average involvement in Special Education (19.5%). In contrast, 30.5% of WBL participants in the Southeast region had IEPs.

Literature

By combining classroom instruction and workforce training, work-based learning (WBL) is rich with student benefits, including advanced skill training and increased rates of college success, career entry, and career advancement (Kobes, 2016). The Pennsylvania Department of Education (PDE) is dedicated to ensuring equitable access to various learning modalities in the Commonwealth, including WBL (Pennsylvania Department of Education, 2023). To this end, two previous research reports in a series on WBL in PA ([Miller, Riccardo, & Hutchison, 2023-a](#); [Miller, Riccardo, & Hutchison, 2023-b](#)) have highlighted descriptive findings for two cohorts of PA high school graduates from the class of 2019 and 2020.

The first report (Miller, Riccardo, & Hutchison, 2023-a) examined rates of participation in specific WBL opportunities and student outcomes, such as postsecondary enrollment and non-degree credential earning by high school graduation. Results from this report found that among Career and Technical Education (CTE) students, 32.4% – 39% (2019 – 2020 cohort) of cohort graduates participated in WBL. Meanwhile, only 12.6% – 10.6% of non-CTE students participated in a non-CTE WBL experience. To build upon these results, a second report in this series (Miller, Riccardo, & Hutchison, 2023-b) further explored participation in WBL by career pathway/CTE program. Results showed that WBL opportunities were more prevalent in certain career clusters or subjects than others; for instance, school-sponsored enterprise opportunities were predominantly taken by secondary CTE students in Hospitality & Tourism programs, while work-based experiences were most common among students in the Human Resources cluster. Additionally, the highest participation rates in a cooperative work experience were among secondary CTE students in the following career clusters: Manufacturing; Transportation, Distribution & Logistics; and Architecture & Construction. While these reports provided a statewide descriptive overview of WBL in PA, a closer examination of WBL participation at the local education agency (LEA) and regional level is necessary to better understand WBL in the Commonwealth.

Work-based learning (WBL) is rich with student benefits, including advanced skill training and increased rates of college success, career entry, and career advancement (Kobes, 2016).

The Geography of Work-Based Learning: Equitable Access for All Students

Despite the widespread adoption of WBL in various educational environments, researchers (Bravenboer & Workman, 2015; Cahill, 2016) have noted that high-quality WBL experiences are often not accessible to historically underserved communities. To meet PDE's goal of providing an equitable and accessible education to all Commonwealth learners, a focused, geographical investigation of WBL in PA is required. Paired with previous findings from this series concerning rates of participation in WBL and outcomes at the secondary and post-secondary level, this mapping report adds geographical context to the WBL landscape in PA.

Data listing the specific Pennsylvania secondary schools which *offered* WBL opportunities were not available; however, data could be utilized for two recent cohorts of secondary CTE students to describe the LEAs where students *participated* in WBL opportunities. As such, the current report addresses the following research question posed to the [PDE Research Agenda](#) to the extent allowed by available data:

Which schools across the state offer work-based learning opportunities and how many students are participating in those opportunities, broken down by student subgroup?

Method

This project utilizes the same cohorts of secondary CTE students from previous reports in this series on WBL in PA.

Two cohorts of CTE students from the high school graduating classes of 2019 ($N = 22,412$) and 2020 ($N = 22,501$) were combined for analysis in the present study ($N = 44,913$). Data records from Pennsylvania’s Information Management System (PIMS) were obtained for school years 2017–18 through 2019–20 to determine students’ involvement in CTE and participation in WBL during their last two years of high school. Table 1 details the years of data utilized for the final combined cohort and for each graduate cohort, respectively. PIMS data also identified student demographic characteristics, as well as the local education agency (LEA) –specifically, school districts (SDs) and career and technical centers (CTCs) – associated with students’ secondary CTE programs. Student records were then aggregated in Tableau software to the level of their SD or CTC to show where students enrolled in CTE programs and subsequently participated in WBL opportunities. LEA-level maps were geocoded in Tableau by the latitude and longitude associated with their LEA name and address via Google Maps search.

To protect student anonymity and mask low student counts at the LEA-level, student records were in some cases aggregated to the regional-level based on the location of their affiliated LEA. Regional maps depict LEAs in the following six geographical territories, based on [PDE’s classification of SDs and CTCs](#): South Central PA, Central/North Central PA, Southwest PA, Southeast PA, Northeast PA, and Northwest PA. Statewide trends in both the LEA- and regional-level maps reveal where WBL opportunities are popular across the Commonwealth and the characteristics of CTE students who participate in them.

TABLE 1. Years of PIMS Data Used by High School Graduate Cohort

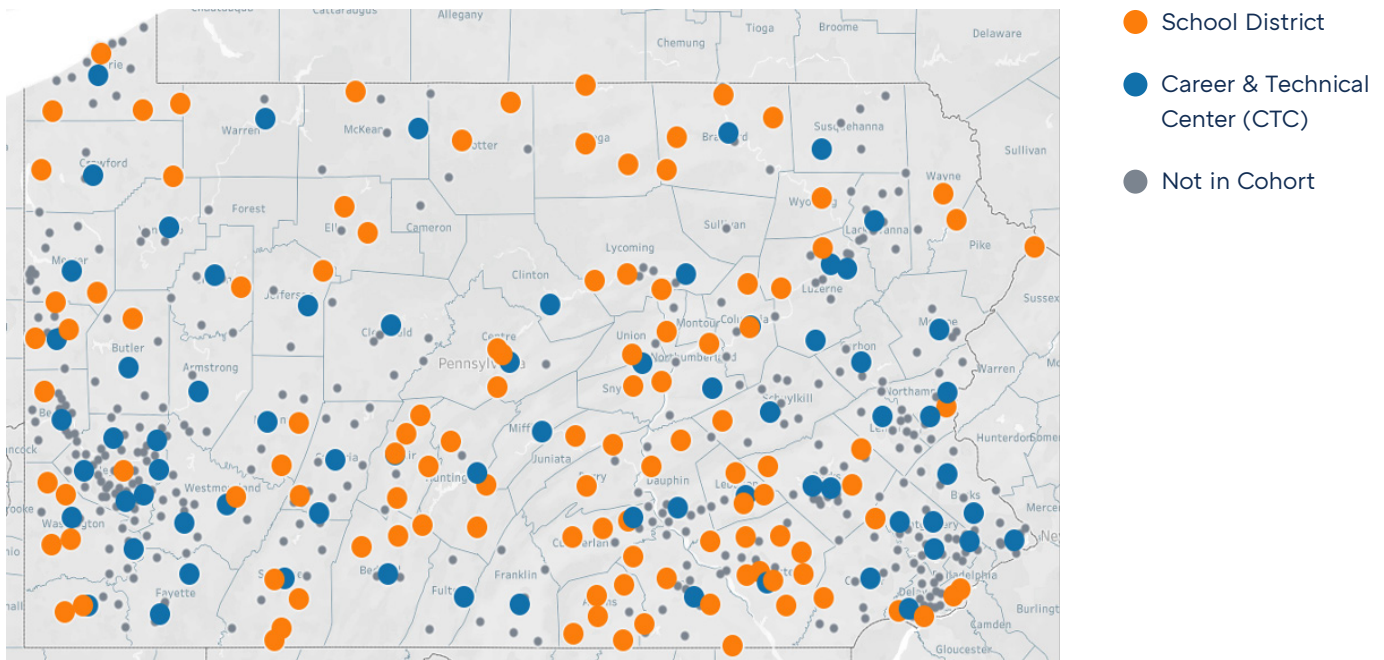
	2017–18	2018–19	2019–20
2019 Cohort ($N = 22,412$)	X	X	
2020 Cohort ($N = 22,501$)		X	X
Combined Cohort ($N = 44,913$)	X	X	X

Results

LEA-Level Maps

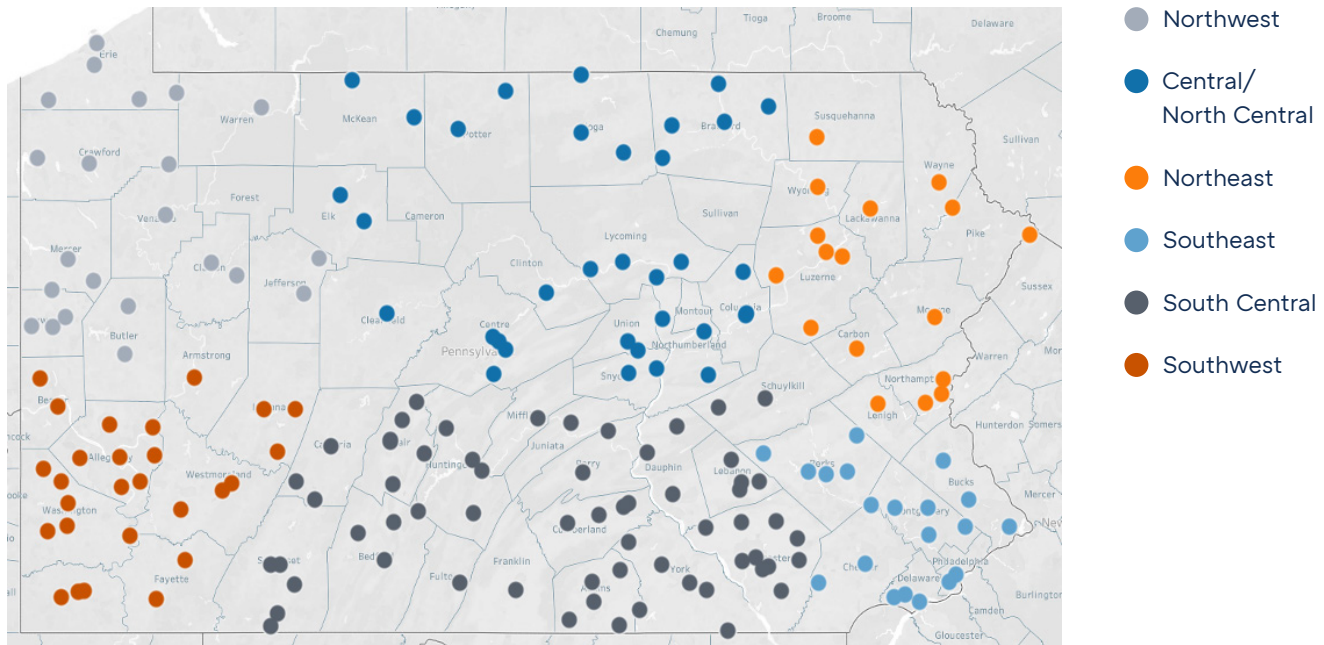
As the fifth most populous state in the United States ([Census Quick Facts, 2023](#)), Pennsylvania is home to over 500 unique school districts or single-unit local education agencies (LEAs) and career and technical centers (CTCs), according to data retrieved from PDE’s Educational Names and Addresses (EDNA) database in early 2023. Figure 1 maps these educational entities onto the 67 counties of Pennsylvania; the 112 orange data points represent school districts which taught CTE students from the currently studied combined graduation cohorts, while the 70 blue data points represent CTCs which taught CTE students in the combined graduation cohorts. Lastly, the 388 small grey data points represent school districts and CTCs which did not teach CTE students from the 2019 or 2020 graduation cohorts.

FIGURE 1. All SDs and CTCs in Combined Cohort in Pennsylvania (as of 2023)



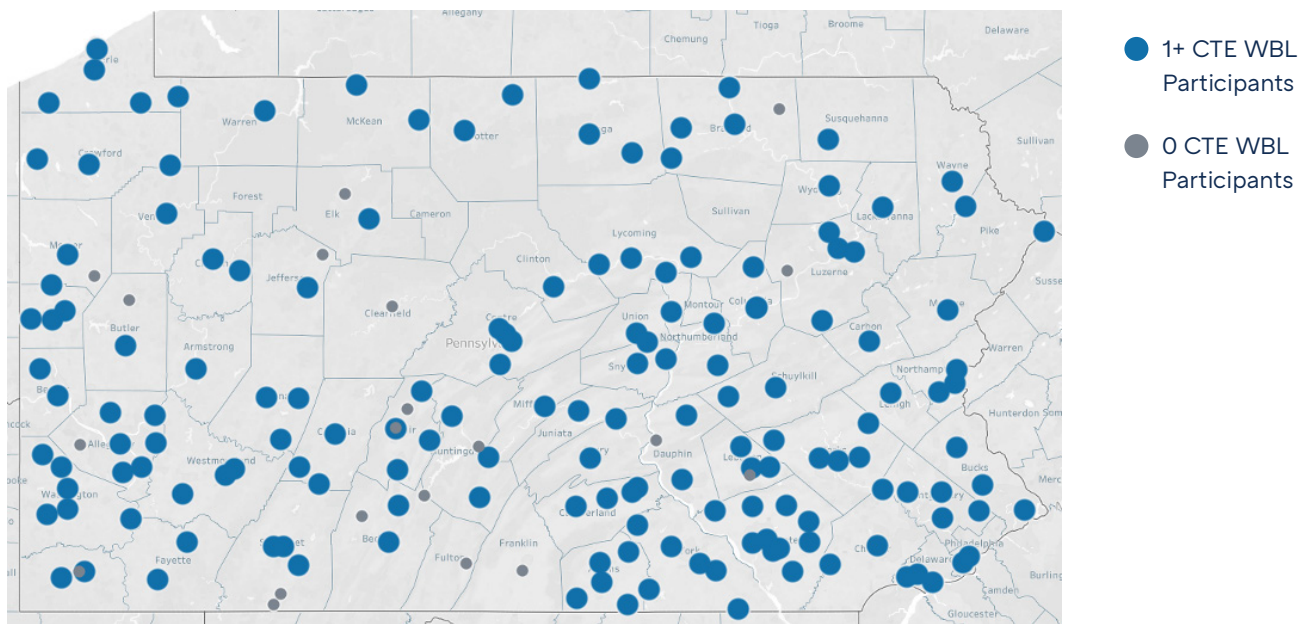
The PDE provides geographical classification for all [school districts](#) and [CTCs](#) in the Commonwealth. Using these designations, six geographical regions were assigned to all LEAs which enrolled CTE students from the current graduation cohorts, depicted in Figure 2: (clockwise from top left) Northwest, Central/North Central, Northeast, Southeast, South Central, and Southwest. Each data point in Figure 2, regardless of color, represents the location of an LEA which taught at least one member of the combined 2019 and 2020 graduation cohort. Note that three PA counties (Cameron, Forest, and Sullivan) had no LEAs which taught CTE students from the present cohorts.

FIGURE 2. LEAs Associated with a CTE Program for Secondary CTE Students in Combined Cohort by Region



Additionally, Figure 3 depicts LEAs which taught at least one CTE student who participated in a WBL opportunity during their CTE program. The large blue data points represent LEAs where at least one student participated in a WBL opportunity in the 2019 or 2020 graduation cohorts, while small gray data points represent LEAs with no WBL participants from the 2019 and 2020 graduation cohorts. This map indicates that WBL participation occurred in the majority of LEAs that cohort students attended (162 out of 182).

FIGURE 3. LEAs Associated with CTE WBL for Secondary CTE Students in Combined Cohort



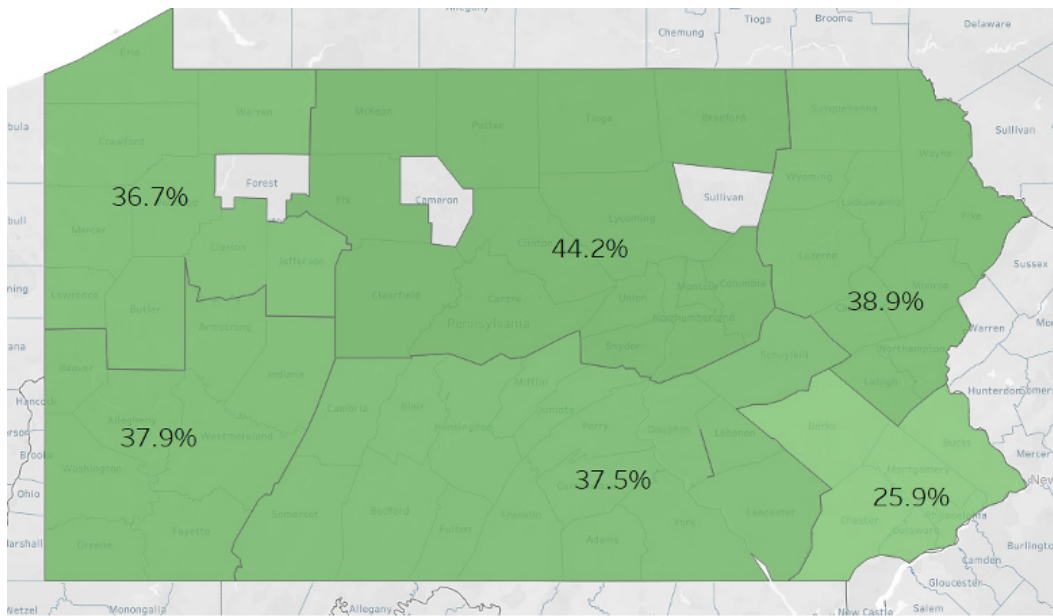
After identifying the geographical placement of each LEA involved in the current study, student CTE enrollment and WBL participation were aggregated to the regional level. This was done to mask low counts of various student groups and WBL opportunities at the LEA-level. Table 2 and Figure 4 detail WBL participation by region as a proportion of the number of CTE enrollments¹ in each region. As described in the first report of this series (Miller, Riccardo, & Hutchison, 2023-a), between 32.4% – 39.0% of CTE students participated in WBL on average within their CTE program statewide. Figure 4 shows that CTE students in the Southeast region participated in CTE WBL at a lower than average rate (25.9%), while students in the Central/North Central region had notably higher participation (44.2%) than the state average.

Table 2. CTE Enrollment and WBL Participation for Secondary CTE Students in Combined Cohort, by Region

Region	# WBL Participants	# CTE Enrollments	% WBL of Total CTE Enrollments
Northwest	1,543	4,201	36.7%
Central/North Central	2,070	4,687	44.2%
Northeast	2,542	6,527	38.9%
Southeast	3,095	11,969	25.9%
South Central	4,338	11,563	37.5%
Southwest	2,584	6,811	37.9%

¹ Note that the number of *CTE enrollments* in each region is distinct from the number of unique *CTE students* in each region, because students may have enrolled in programs at multiple LEAs within and across regions.

FIGURE 4. Participation in WBL as a Proportion of Total CTE Enrollments in Combined Cohort, by Region



LEAs by Region

Although a comprehensive list of PA LEAs that offered CTE WBL opportunities was not available, student cohort data could be used to identify LEAs where one or more CTE students participated in a WBL opportunity. The percentage of LEAs in each region which taught one or more WBL participants in these cohorts can be found in Table 3. Note that although the Southeast region had the lowest rate of participation in WBL (25.9%) as a proportion of the students enrolled (see Figure 4), Table 3 indicates that one hundred percent of the LEAs attended by cohort graduates in the Southeast region ($n = 20$) enrolled at least one WBL participant. This suggests that the Southeast student population’s relatively low participation in WBL cannot be attributed to a lack of access to opportunities in the region.

TABLE 3. LEAs Associated with CTE Enrollment and WBL Participation for Secondary CTE Students in Combined Cohort, by Region

Region	# LEAs with 1+ CTE Student	# LEAs with 1+ WBL Participant	% LEAs with 1+ WBL Participant
Northwest	22	19	86.4%
Central/North Central	34	31	91.2%
Northeast	17	16	94.1%
Southeast	20	20	100.0%
South Central	62	51	82.3%
Southwest	27	25	92.6%
TOTAL	182	162	89.0%

In addition to reporting general participation in any type of CTE WBL, engagement in specific WBL opportunities by geographical region was examined. These eight CTE WBL opportunities² include agriculture experiences, apprenticeships, cooperative work experiences, internships, job explorations, school-sponsored enterprises, simulated work environments, and work-based experiences. Note that for the current report, participation in apprenticeships is not discussed due to low participation within the studied graduation cohorts. Figure 5 shows the percentage of LEAs within a region with at least one cohort student who participated in an agriculture experience; noticeably, percentages are higher in the two central territories of PA and lower in the east and west. Rates were especially low in the Northeast region, where CTE students in the combined cohort participated in agriculture experiences at only 5.9% (1 out of 17) of the LEAs they attended.

FIGURE 5. Percentage of Cohort LEAs in Region with At Least One Agriculture Experience Participant

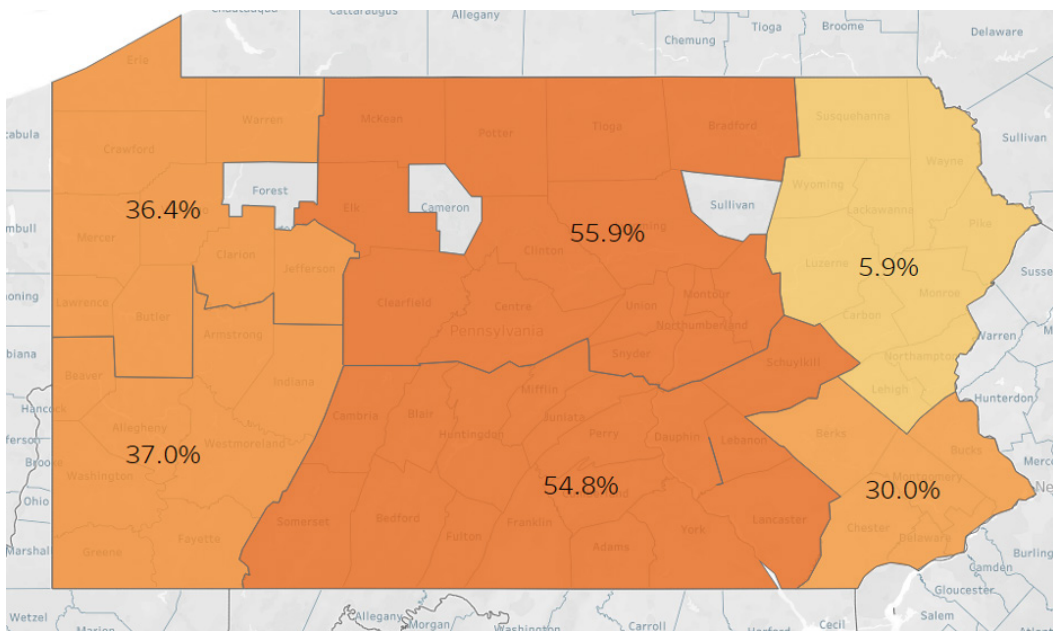


Figure 6 displays the percentage, by region, of school districts and CTCs in the current cohort analysis which taught one or more students who participated in a cooperative work experience. The highest percentages in the Commonwealth were located the Northeast and Southeast regions (76.5% and 65%, respectively), while lower percentages (38.7% and 41.2%, respectively) were located in the South Central and the Central/North Central territories. Additionally, Figure 7 shows the percentages of LEAs by region which taught one or more CTE students who participated in an internship. The Southeast region had the highest percentage of LEAs which taught one or more internship students from the present cohorts (55%), while the Northwest region had the lowest percentage (13.6%).

² For a detailed description of the WBL opportunities explored in this report, see Appendix B of [Miller, Riccardo, & Hutchison. \(2023-b\)](#).

FIGURE 6. Percentage of Cohort LEAs in Region with At Least One Cooperative Work Experience Participant

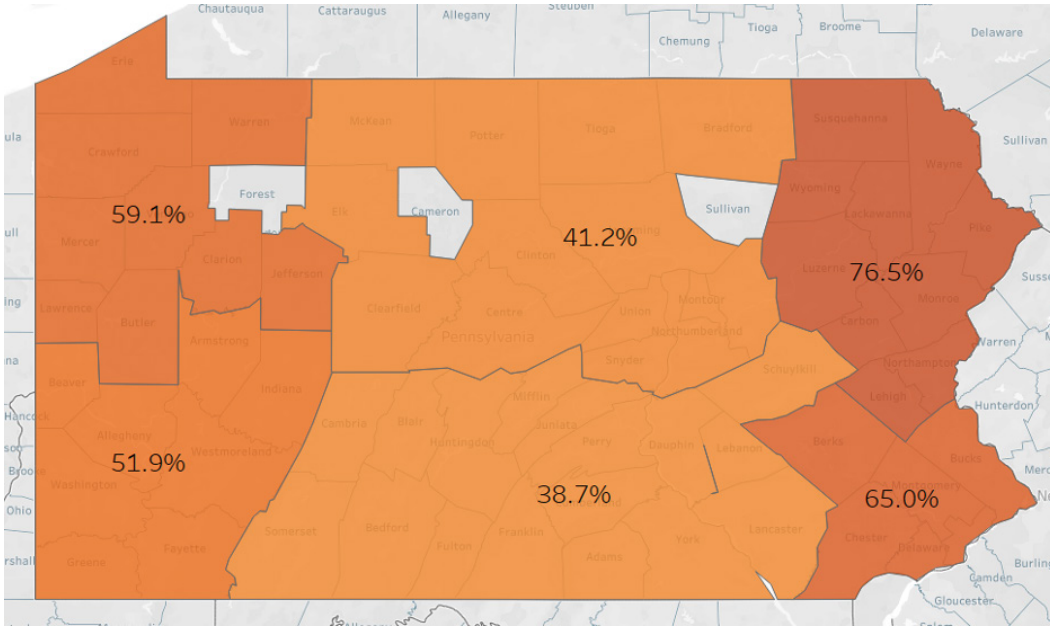


FIGURE 7. Percentage of Cohort LEAs in Region with At Least One Internship Participant

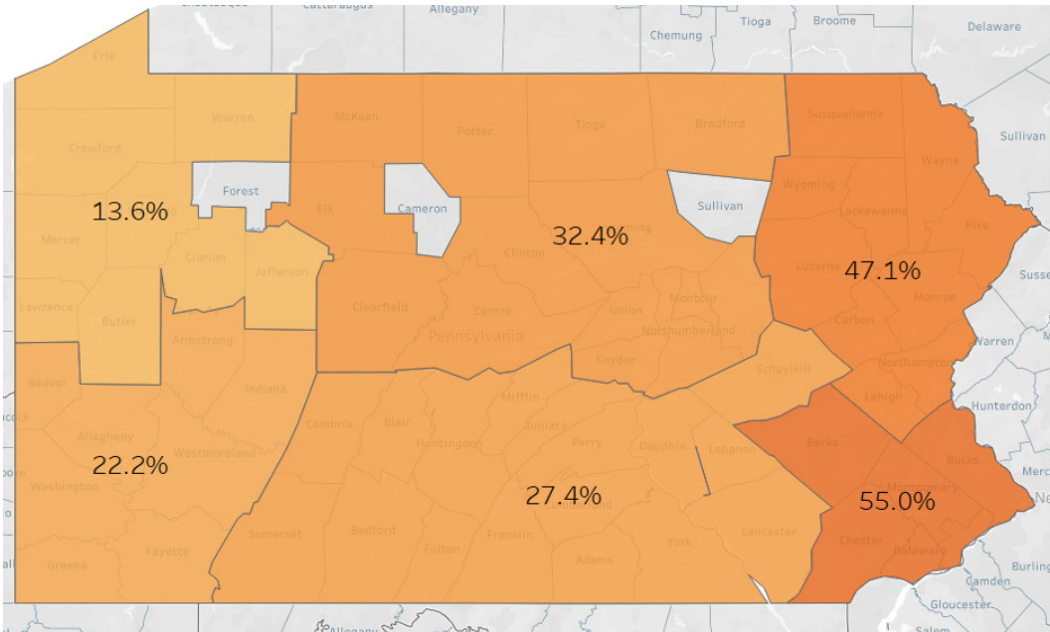


Figure 8 displays, by geographical region, the percentage of cohort LEAs which taught one or more students who participated in the job exploration CTE WBL opportunity. The highest percentage of job exploration participation among attended LEAs was in the Southwest region (44.4%), while the lowest percentage was found in the Northwest region (13.6%). Additionally, Figure 9 shows the percentage of cohort school districts and CTCs which taught one or more students who participated in a school-sponsored enterprise experience. Results showed that 30% of cohort LEAs in the Southeast region taught one or more school-sponsored enterprise students, while only 14.7% and 14.8% of cohort LEAs in the Central/North Central and Southwest territories (respectively) taught one or more school-sponsored enterprise students.

FIGURE 8. Percentage of Cohort LEAs in Region with At Least One Job Exploration Participant

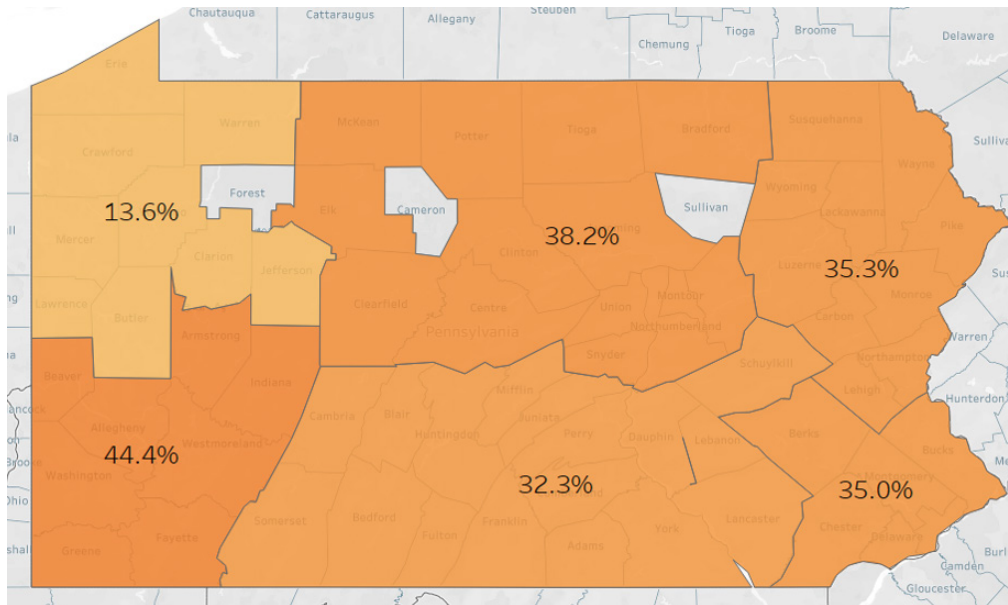


FIGURE 9. Percentage of Cohort LEAs in Region with At Least One School-Sponsored Enterprise Participant

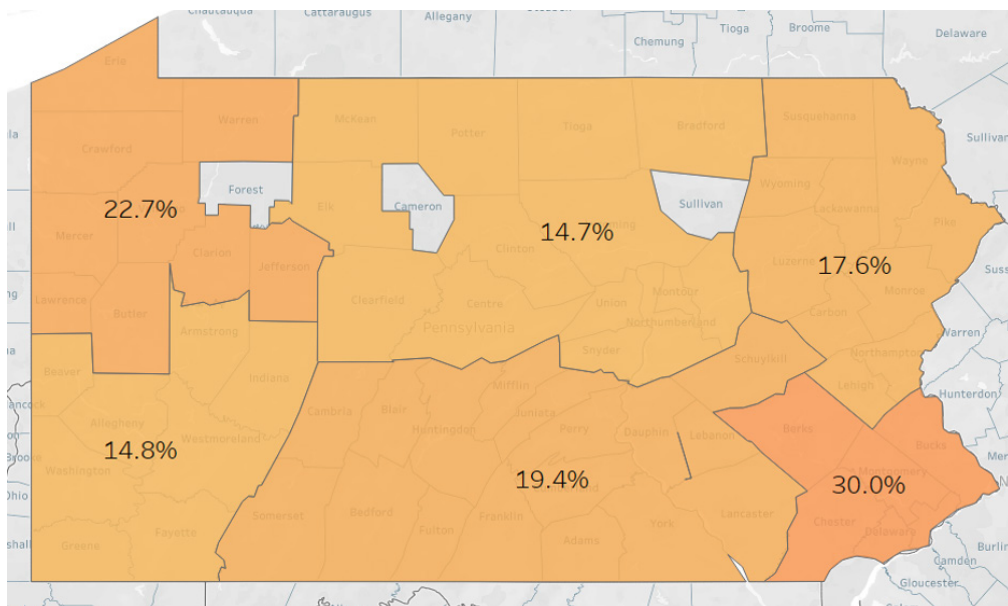


Figure 10 shows the percentage of LEAs, by region, which taught one or more cohort students who participated in a simulated work environment experience. The Southeast region had the highest percentage of LEAs teaching at least one simulated work experience participant (35%), while the Northwest region had the lowest percentage (18.2%). Finally, while percentages of cohort LEAs which taught one or more students who participated in work-based experiences were similar across PA regions, Figure 11 shows that the Northeast region had the highest percentage (35.3%), while the South Central region had the lowest percentage (25.8%).

FIGURE 10. Percentage of Cohort LEAs in Region with At Least One Simulated Work Environment Participant

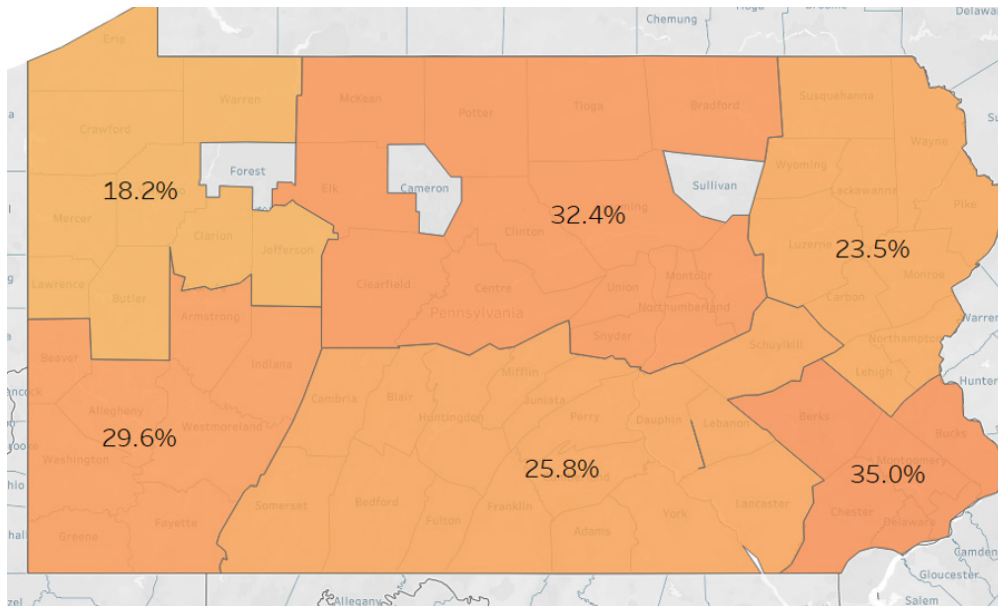
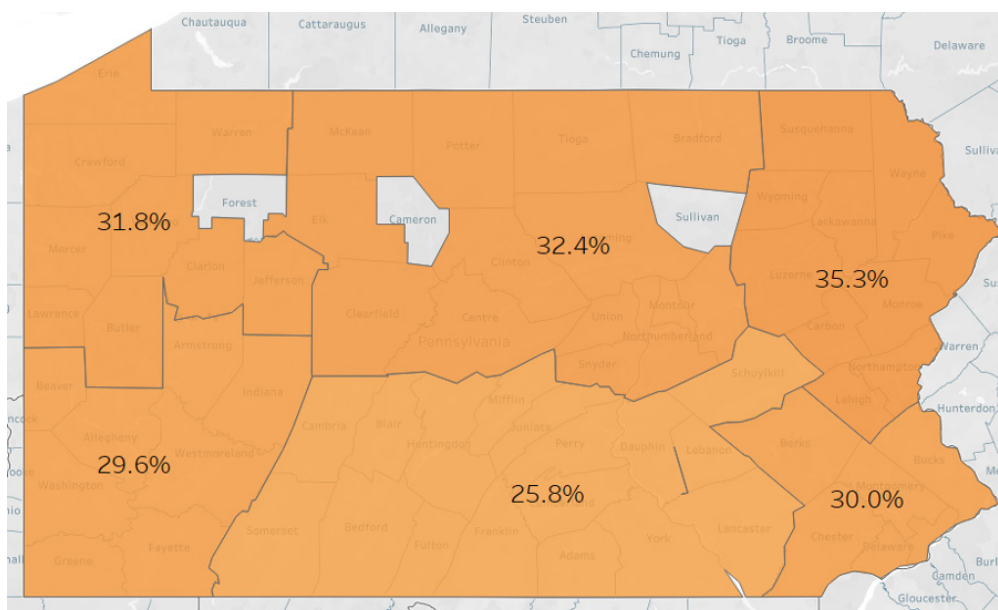


FIGURE 11. Percentage of Cohort LEAs in Region with At Least One Work-Based Experience Participant

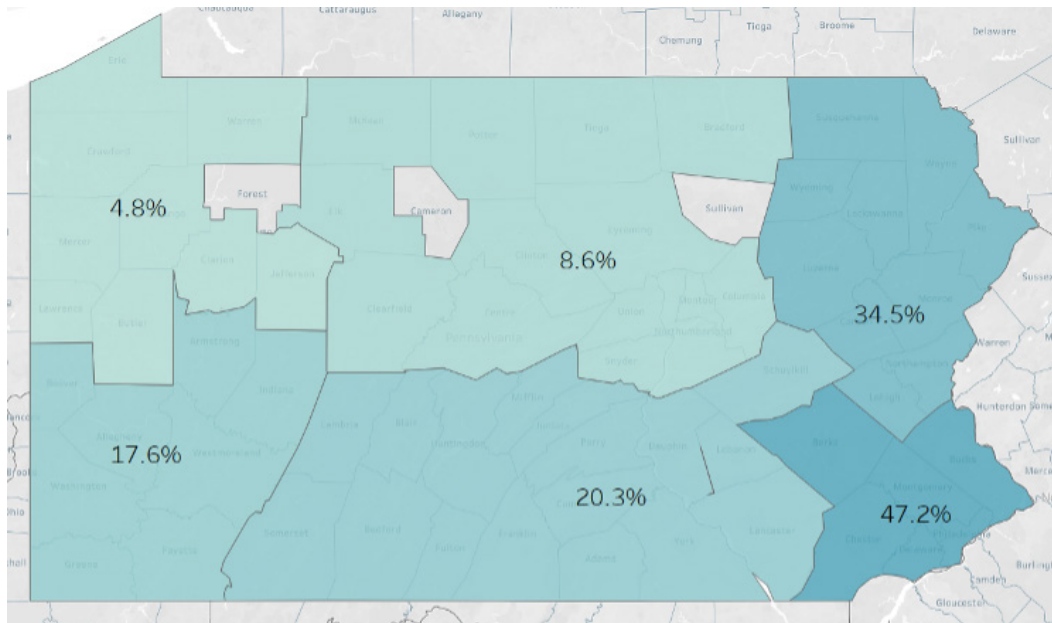


Characteristics of WBL Participants

To better understand WBL participant characteristics, analyses identified CTE enrollments³ associated with participation in at least one WBL opportunity (*WBL participants*) and the demographic characteristics of the students who participated. Figure 12 depicts WBL participants of color⁴ as a proportion of all WBL participation in the region. For example, of the 1,543 records reporting WBL participation in the Northwest region, only 4.8% (74) were associated with CTE students of color. In contrast, nearly half (47.2%) of all WBL participants in the Southeast region were students of color, equivalent to 1,461 of the 3,095 reported WBL records in the region. Depicting WBL participation for all CTE students of color allows reporting to be inclusive of all PDE-reported student races/ethnicities while shielding low n-counts by region.

Where possible, further disaggregation by race/ethnicity is also reported, as in Figure 13 and Table 4. Shown in Figure 13, between 1.7% and 5.9% of all WBL participants in the Northwest, Central/North Central, Northeast, and South Central regions were Black. These proportions are dramatically less than in the Southwest and Southeast regions, where Black CTE students constituted 13.4% and 25.9% of all WBL participation, respectively. These regional differences contextualize the statewide findings from Miller, Riccardo, & Hutchison (2023-a), which reported that between 9% and 10.9% of CTE WBL participants in the 2019 and 2020 graduate cohorts were Black. Note that the described racial/ethnic differences among WBL participants generally align to regional demographic representation among the overall CTE populations (shown in Table 5).

FIGURE 12. Students of Color as a Proportion of CTE WBL Participants by Region



3 The number of *CTE enrollments* in each region is distinct from the number of unique *CTE students* in each region, because students may have enrolled in programs at multiple LEAs within and across territories.

4 Classification for WBL students of color include the following PDE-reported student races/ethnicities: American Indian/Alaskan Native, Black or African American, Hispanic (any race), Multi-Racial, Asian, and Native Hawaiian or other Pacific Islander. This determination does not include White students.

FIGURE 13. Black Students as a Proportion of CTE WBL Participants by Region

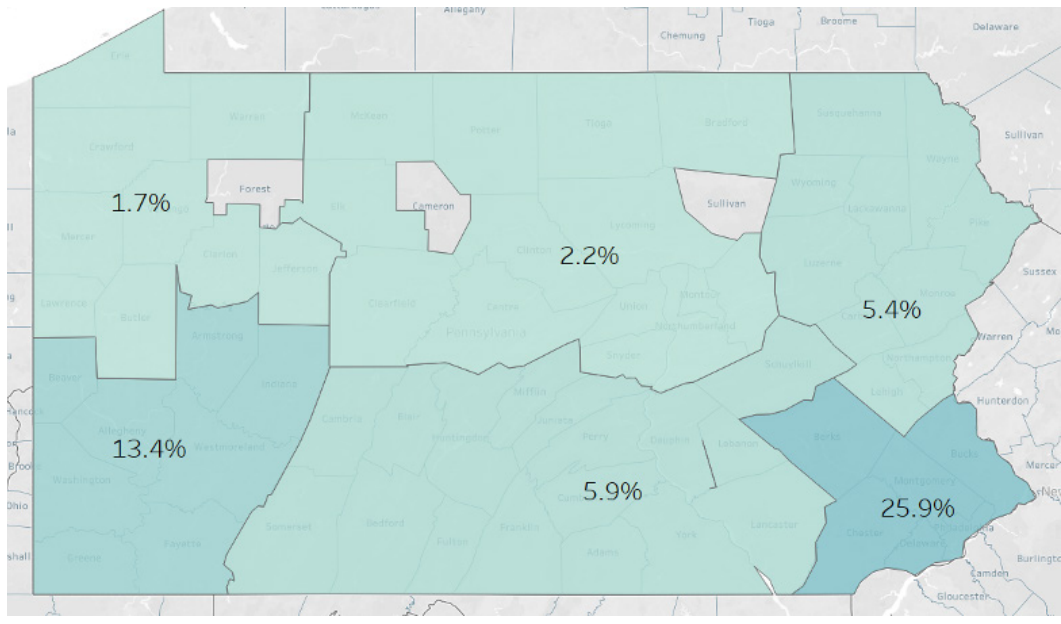


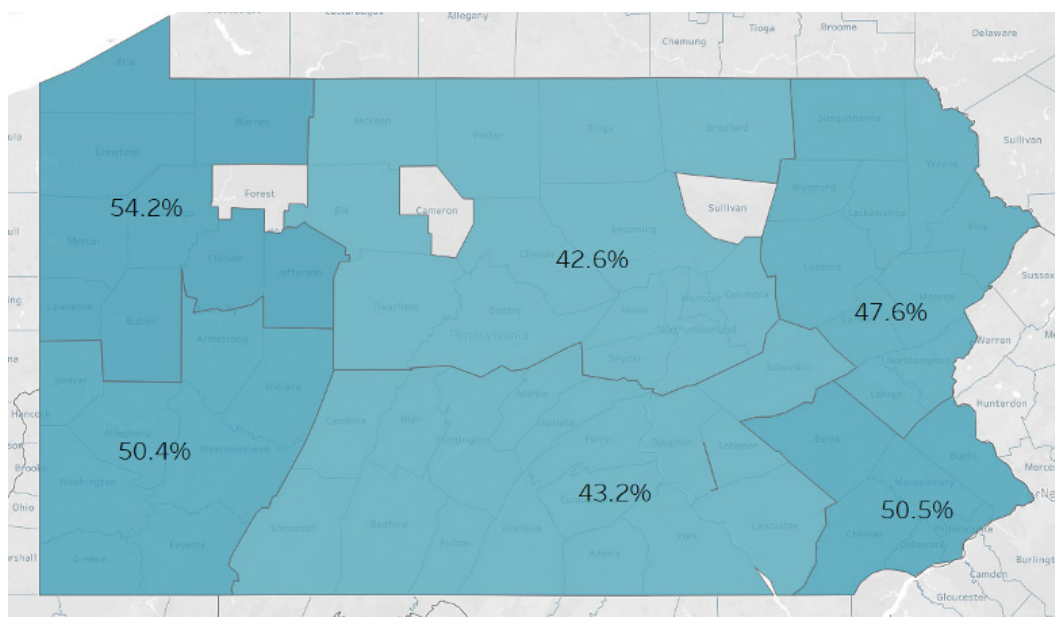
TABLE 4. Racial/Ethnic Characteristics of WBL Participants, by Region

Region	White	Asian	Hispanic	Multi-Racial	Total WBL Participants
Northwest	95.2%	*	*	1.6%	1,543
Central/North Central	91.4%	1.0%	3.1%	1.8%	2,070
Northeast	65.5%	1.0%	26.0%	1.8%	2,542
Southeast	52.8%	1.4%	17.8%	2.0%	3,095
South Central	79.7%	1.6%	10.4%	2.1%	4,338
Southwest	82.4%	0.8%	0.9%	2.1%	2,584

**Note: Percentages omitted to mask cell counts less than 20 students.*

Figure 14 shows the percentage of WBL participants in each region who experienced economic disadvantage during their secondary CTE program. As previously reported in the first descriptive study in this Commonwealth WBL series (Miller, Riccardo, & Hutchison, 2023-a), more than half of all CTE students in the graduating cohorts of 2019 (50.9%) and 2020 (50.5%) experienced economic disadvantage, while a minority of WBL participants experienced economic disadvantage (46.6% and 48.4%, respectively). The percentages depicted in Figure 14 demonstrate that economic disadvantage among WBL participants differed regionally. WBL participants in the Northwest, Southeast, and Southwest territories experienced economic disadvantage at rates above the statewide average for WBL participants. While regional rates of economic disadvantage among CTE WBL participants are similar to the overall regional rates among the CTE student population (see Table 6), CTE WBL participants in the Central/North Central and Northeast regions experienced slightly lower rates of economic disadvantage compared to the total CTE cohort population.

FIGURE 14. Economic Disadvantage Status as a Proportion of CTE WBL Participants by Region

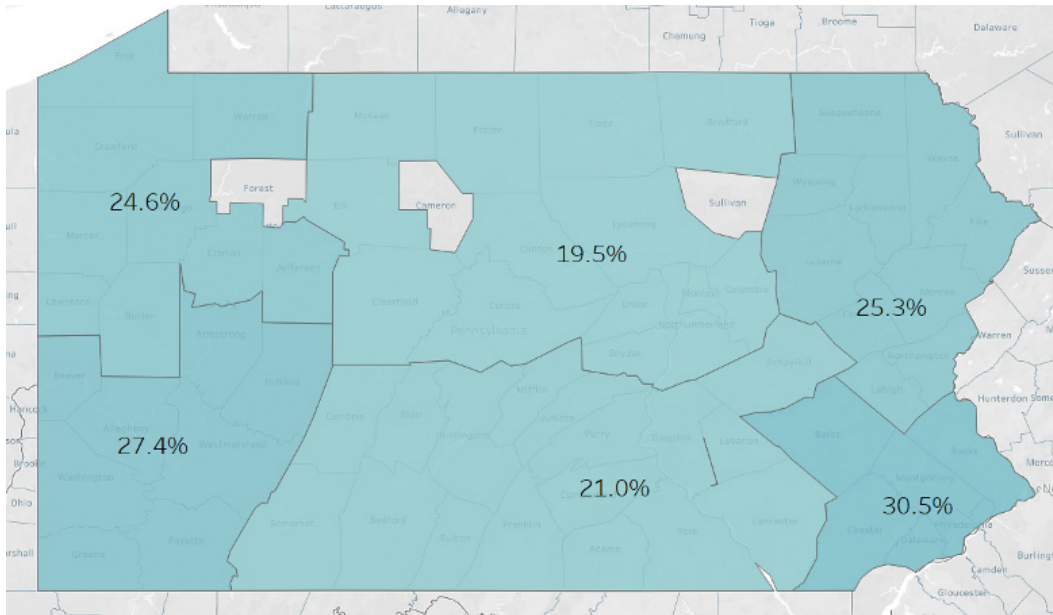


Likewise, Figure 15 depicts regional differences in the proportion of WBL participants with IEPs. The first descriptive report (Miller, Riccardo, & Hutchison, 2023-a) details that 24.3% and 25.0% of WBL participants were involved in Special Education in the 2019 and 2020 cohorts, respectively. Figure 15 suggests that WBL participants in the Central/North Central region had lower than average involvement in Special Education (19.5%). In contrast, 30.5% of WBL participants in the Southeast region had IEPs, which is notably higher than the statewide average among WBL participants. Regional rates of IEPs were similar between CTE WBL participants and the general CTE population (Table 6), but IEP rates were slightly lower for CTE WBL participants. Finally, Figure 16 shows WBL participants who qualified for PDE’s historically underperforming status⁵. Although more than half of all WBL participants qualified as historically underperforming status in all territories, WBL participants in the Northwest, Southeast, and

⁵ Historically underperforming status refers to students who met the criteria for any of the following: English Learners (ELs), students with IEPs, and students with economic disadvantage.

Southwest territories had the highest proportions of historically underperforming students. Regional percentages between CTE WBL participants and the general CTE population were relatively similar (see Table 6). However, CTE WBL participants in the Northeast and Southwest regions were less likely to have the historically underperforming status when compared to the general CTE population.

FIGURE 15. Special Education Status as a Proportion of CTE WBL Participants by Region



*Note: Figure 15 reflects WBL opportunities **taken within CTE programs**. This map may not include opportunities taken as part of an IEP transition plan, if taken outside of a secondary CTE program.

FIGURE 16. Historically Underperforming Status as a Proportion of CTE WBL Participants by Region

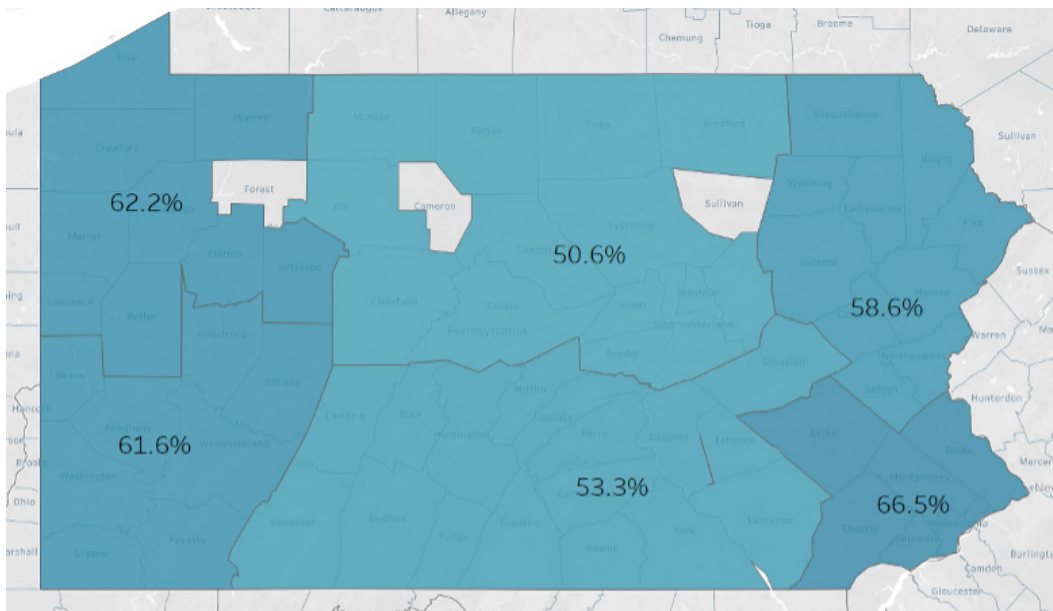


TABLE 5. Racial/Ethnic Characteristics of CTE Population, by Region

Region	Students of Color	Black	Asian	Hispanic	Multi-Racial	Total CTE Enrollments ⁶
Northwest	9.8%	4.4%	1.0%	1.9%	2.3%	4,201
Central/North Central	7.2%	2.1%	0.7%	2.5%	1.5%	4,687
Northeast	37.7%	8.5%	1.1%	25.9%	1.9%	6,527
Southeast	51.7%	26.7%	3.0%	19.3%	2.5%	11,969
South Central	19.6%	5.6%	1.1%	10.3%	2.4%	11,563
Southwest	16.9%	11.8%	0.8%	1.4%	2.6%	6,811

TABLE 6. Other Demographics of CTE Population, by Region

Region	Economic Disadvantaged	Has an IEP	Historically Underperforming	Total CTE Enrollments ⁶
Northwest	54.0%	27.6%	64.1%	4,201
Central/North Central	46.0%	22.1%	54.1%	4,687
Northeast	52.4%	28.3%	64.6%	6,527
Southeast	52.4%	30.9%	67.6%	11,969
South Central	45.9%	22.9%	56.1%	11,563
Southwest	55.1%	32.5%	67.4%	6,811

Conclusion

Work-based learning (WBL) opportunities expose students to valuable career skills and standards that employers seek. A previous report (Miller, Riccardo, & Hutchison, 2023-a) in this Commonwealth series on WBL in Pennsylvania detailed the statewide rates of WBL participation for secondary CTE students from two recent cohorts of high school graduates. The current report took a geographical approach by mapping WBL opportunities at the LEA- and regional-level to see differences in participation across the state. Tableau maps depicted the school districts and career and technical centers attended by students in these cohorts and identified LEAs where at least one CTE student participated in a WBL opportunity during their secondary CTE program. Results indicate that WBL participation occurred in the majority of LEAs that cohort students attended (162 out of 182). Regional maps showed differences in WBL participation by opportunity type and regional trends in participant characteristics. The regional differences discussed in this report help to contextualize the previously reported statewide rates of participation in WBL opportunities and the characteristics of students who take them. These findings inform the work of state stakeholders interested in expanding secondary CTE student participation in WBL and improving issues of access and equity for all PA learners.

⁶ The number of *CTE enrollments* in each region is distinct from the number of unique *CTE students* in each region, because students may have enrolled in programs at multiple LEAs within and across territories.

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