WICHE
Western Interstate Commission
for Higher Education

A Glimpse Beyond State Lines

Student Outcomes from WICHE's Multistate Longitudinal Data Exchange Pilot Project

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Western Interstate Commission for Higher Education

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The Policy Analysis and Research unit is involved in the research, analysis, and reporting of information on public policy issues of concern in the WICHE states.

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Table of Contents

Acknowledgments vi
Summary 1
Students in the Cohort 2
Participation and Success in Postsecondary Education 5
Enrollment and Participation in College
First-Time College Students 6
Cohort A, Class of 2005 High School Graduates 7
Areas for Further Investigation 8
Degree Completion
First-Time College Students 9
Student Characteristics 10
Cohort A, Class of 2005 High School Graduates 13
Cohort B, First-Time College Students Who Were Not Class of 2005 High School Graduates of the Exchange States 14
Mobility: Where Graduates Are Found Working or Seeking Further Education 14
Location of Employment and Further Enrollment Among Degree-Earners 16
Location of Employment Among College Students Who Did Not Complete a Degree 18
Location of Employment and Further Enrollment Among Cohort A, Class of 2005 High School Graduates 19
Direct College-Going High School Graduates Who Completed a Degree 19
Direct College-Going High School Graduates Who Did Not Complete a Degree 21
High School Graduates Who Delayed College 22
The Value of Exchanging Data: Student Mobility 23
Earnings Outcomes 25
Conclusions 30
Endnotes 31
Appendix A: Technical Details 33
Appendix B: National Student Clearinghouse Data Preparation and Coverage 49
References 53

List of Figures and Tables

Figures

Figure 1. Cohort of Public High School Graduates and First-Time College Students of Hawai'i, Idaho, Oregon, and Washington 2
Figure 2. Primary Student Groupings for Analysis, Relative to Cohorts 4
Figure 3. Demographic Characteristics, All Students in the Cohort 5
Figure 4. Cohort A, Class of 2005, High School Graduates College Enrollment 7
Figure 5. All First-Time College Students: Highest Degree Completed, by Student Characteristics 11

Figure 6. All First-Time College Students: Highest Degree Completed, by Pell Receipt 11
Figure 7. All First-Time College Students: Highest Degree Completed, by Pell Receipt, Age Began College and Race/Ethnicity 12
Figure 8. Cohort A, Class of 2005 High School Graduates' Degree Completion, by Student Characteristics 13
Figure 9. Cohort B Degree Completion, by Student Characteristics 15
Figure 10. Location of Work and Education Approximately 12 Months After Degree Was Awarded, Associate's Degree or Higher Earned from an MLDE State by December 2010, Overall 17
Figure 11. Location of Work and Education Approximately 12 Months After Degree Was Awarded, Associate's Degree or Higher Earned from an MLDE State by December 2010, by State 18
Figure 12. Where Students Who Did Not Complete at Least an Associate's Degree by December 2010 Were Found Working After Their Last Enrollment 19
Figure 13. Highest Degree Completed, by Location, Cohort A Class of 2005 High School Graduates Who Went Directly to College 20
Figure 14. Location of Work and Education Approximately 12 Months After Completing a College Degree, High School Graduates Who Went Directly to College 21
Figure 15. Highest Degree Completed, by Location, Cohort A High School Graduates Who Delayed College More Than a Year After Graduating High School 23
Figure 16. Value of Exchanging Data, Additional Post-Degree Outcomes Revealed from Other Three MLDE States' Data 24
Figure 17. Quarterly Earnings Approximately 10-12 Months After Award Conferred, Students Who Completed Degree by December 2010 27
Figure 18. Quarterly Earnings Approximately 10-12 Months After Award Conferred, Students Who Completed Degree by December 2010, by Degree Level 27
Figure 19. Quarterly Earnings in Wage Quarter After Last Enrollment, Students Who Did Not Complete a Degree by December 2010 28
Figure 20. Quarterly Earnings Approximately 10-12 Months After Award Conferred, Bachelor's or Higher Degrees Completed by December 2010, by CIP Category 29

Tables

Table 1. Students by Cohort and Submitting State 3
Table 2. Basic Enrollment Patterns, Overall and by Cohort 6
Table 3. Cohort A, Class of 2005 High School Graduates' College Enrollment Patterns by State of Attendance 8
Table 4. Highest Degree Completed, All First-Time College Students 9
Table 5. Recently Graduated Cohort Students Found Working In-State Who Graduated Elsewhere 24
Table 6. Categorization of Students for Earnings Analysis 26

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A number of individuals were instrumental in launching and supporting WICHE's Multistate Longitudinal Data Exchange project that led to the results we present in this report. First and foremost among them were representatives of each of the participating states' K-12, higher education, and labor agencies. We are indebted to them for their active partnership throughout four years of project development and data extraction, and their contributions to the formulation and review of the results we report here. Our thanks also go to the National Student Clearinghouse staff for its careful handling of these data, preparation of the datasets supplied to WICHE and the states, and their many other invaluable contributions. Additionally, David Longanecker, WICHE's president, and Demarée Michelau, director of policy analysis at WICHE, Hans L'Orange of the State Higher Education Executive Officers (SHEEO), and Peter Ewell and Karen Paulson of the National Center for Higher Education Management Systems (NCHEMS), each of whom contributed invaluable technical advice and logistical support. We thank Jere Mock and Paul Albright for their editorial assistance and Candy Allen for producing the layout and graphics in this report. Finally, WICHE is sincerely thankful to the Bill & Melinda Gates Foundation for its generous support of this important project.

Summary

This section presents findings from an array of analyses of the combined dataset covering 192,689 students from the four states participating in WICHE's Multistate Longitudinal Data Exchange Pilot (hereafter, 'MLDE' or 'Exchange'). Among other things, these results describe what can be known about participation in postsecondary education, degree completion, employment, and geographic mobility. The findings provide detail about what happened to students who were Class of 2005 high school graduates or first-time college undergraduates at public institutions in these states during the 2005-06 academic year as they made their way into and through college, and beyond. These results provide evidence about the value of WICHE's MLDE, providing valuable information to public policymakers concerned with human capital and workforce development. At times, the implications of the results in this report are clear, while at other times the results hint at insights worth further exploration. In general, these findings document the MLDE pilot project's proof of concept, showing the need for cross-state data in examining post-collegiate outcomes while also demonstrating that it is possible to assemble such data and make them available to participating states.

The selected results presented in this report relate to the three overarching research questions embedded in the memorandum of understanding, with appropriate disaggregations:

1. What are the patterns of postsecondary enrollment and employment of high school graduates from each participating state?
2. What are the patterns of postsecondary enrollment and employment of students in public postsecondary institutions in participating states?
3. By more fully accounting for individual mobility across state lines, to what extent does sharing data among states supplement existing state data resources available for conducting evaluations leading to policy and program improvements?

Below are some key findings presented in the report:

- Virtually half of the public college students in the four states were recent high school graduates of the states (49 percent).
- Almost two-thirds of the first-time college students who weren't recent high school graduates of the states, were 20 years or older when they started college (64 percent).
- Almost two-thirds of the first-time college students had their first enrollment in a 2-year institution (64 percent).
- Three-quarters of the states' public high school graduates attended college at some point in the six years (75 percent).
- Overall, 37 percent of the first-time college students completed at least an Associate's degree in six years; the states' recent high school graduates were more likely to have completed a Bachelor's in this time than other first-time college students.
- Students who received a Pell grant at least once completed Associate's degrees at higher rates but Bachelor's degrees at lower rates than those

who never received a Pell grant. Also, among students who started older or were underrepresented minorities, those who received a Pell grant at least once completed an Associate's or higher degree at higher rates.

- More than 60 percent of college graduates were still in the state they graduated college at about a year after receiving their degree. College students who were recent high school graduates of the states were found in-state after graduating college at slightly higher rates than other college graduates.
- The data exchanged among the four states made it possible to determine outcomes for 7 percent more college graduates than had the data not been exchanged.
- Median earnings for college graduates varied by as much as 50 percent depending on whether the student continued studying after their degree or moved out of state, among other circumstances that led to considerable post-degree earnings variation.

Students in the Cohort

First, we set the stage for readers to understand the cohort of students that were formed for this study. Detailed explanations of how the underlying student cohorts were defined, compiled and the data cleaned can be found in the primary MLDE project report, *Beyond Borders: Understanding the Development and Mobility of Human Capital in an Age of Data-Driven Accountability*[1] and in Appendix A: Technical Details. Figure 1 provides a high-level view. 'Cohort A' refers to the students who were Class of 2005 public high school graduates from Hawai'i, Idaho, Oregon or Washington. 'Cohort B' refers to college students who enrolled at a public postsecondary institution in one of these four MLDE states for the first time during the 2005-06 academic year. The relatively broader Cohort B group therefore encompasses any Class of 2005 high school graduates of the MLDE states from Cohort A who enrolled in a public postsecondary institution in one of the four states between Spring 2005 and Summer 2006 (shown as the green overlap in Figure 1). And it also includes in-state residents of any other age, plus students of any age who came from outside the states, who were first time college students in these states public institutions, as shown by segment of Cohort B that does not overlap with Cohort A.

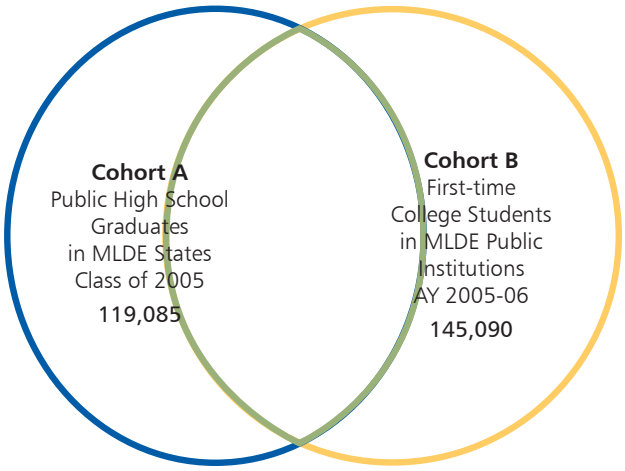


Figure 1. Cohort of Public High School Graduates and First-time College Students of Hawai'i, Idaho, Oregon, and Washington

We do not illustrate in this high-level graphic, the students who are not covered by the cohorts defined for this study, which includes home-schooled and private high school graduates who were not specifically captured in Cohort A, and college students in academic year 2005-06 who were not first-time students or who attended private colleges, among other possible exceptions.[2]

Before proceeding, we should make clear that Figure 1 illustrates the two overarching sources of students that are covered by this study, and all students are aggregated together in Cohort A or B regardless of which of the four states they originated in. We present it at this high level, and not depicted by state, because we principally combine all students across all four states for a regional view in this report. However, we do acknowledge that for many education policy issues one would look at a single state's results. Table 1 shows the numerical and percent distribution of students in the cohorts by state of origin. For Cohort A students, this refers to the state of high school graduation. For Cohort B students who are not also encompassed in Cohort A, the state of origin refers to the state in which the student was first observed enrolled at a public postsecondary institution. One-half of the students in the combined dataset were Class of 2005 high school graduates or first-time college students in Washington, another third from Oregon, and 11 and 7 percent from Idaho and Hawai'i, respectively.

Table 1. Students by Cohort and Submitting State

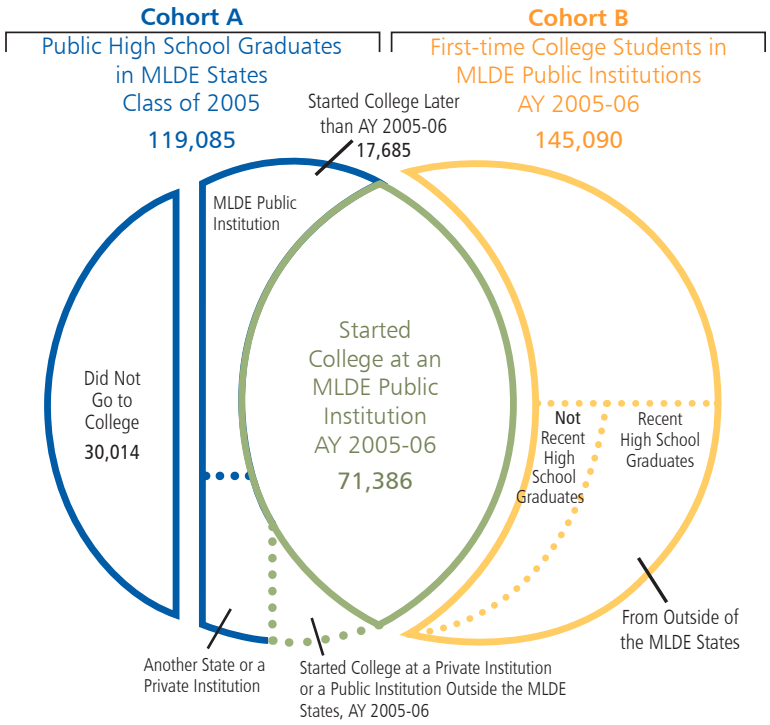
	Number of Students			Percent of Cohort Total		
State of origin	Cohort A	Cohort B	Total	Cohort A	Cohort B	Total
Hawai'i	10,847	3,119	13,966	9%	4%	7%
Idaho	12,856	8,038	20,894	11	11	11
Oregon	33,407	30,491	63,898	28	41	33
Washington	61,975	31,837	93,812	52	43	49
Multiple		119	119		<1	<1
Total	119,085	73,604	192,689			

Note: The Cohort B and overall totals reflect duplication from 119 students reported in multiple states' cohort of first-time college students.

In Figure 2, we start with the basic cohorts of students in Figure 1, and further clarify several important factors relating to how the overall cohort of students will be partitioned for the results we present in this report, largely based on their initial entry point into college. Some of these distinctions are made for conceptual clarity, while others are to distinguish students along lines that are important to policy making or because one might expect different behavior or results for certain groupings of students.

The first point of Figure 2 is where Cohort A public high school graduates go to college. The leftmost offset segment of Cohort A indicates the 30,014 high school graduates who did not go to college. The middle segment of Cohort A indicates the 17,685 public high school graduates who went to college, but not until at least a year after they graduated high school. And, this portion highlights that some went to public institutions in the four MLDE states, while some went to private institutions in one of the MLDE states or went elsewhere in the nation. The rightmost green segment of Cohort A encompasses the public high school graduates from these states who went to college within a year after high school graduation, i.e., in academic year 2005-06. The portion indicated by the solid line is the students who started in a public institution in an MLDE state (and are the part

Figure 2. Primary Student Groupings for Analysis, Relative to Cohorts



Notes: Green dotted segment = the portion of Cohort A who began college at a private institution in an MLDE state or elsewhere in the nation, in academic year 2005-06. Private or homeschooled high school graduates, from an MLDE state or elsewhere, may be among the Cohort B first-time college students.

of Cohort B that overlaps in Figure 1). The segment indicated by the dotted line acknowledges that some Cohort A public high school graduates began at a private institution in an MLDE state or elsewhere in the nation, in academic year 2005-06.

It is a key point of interest in policy making, what happens with recent high school graduates who attend in-state public institutions (the 71,386 students in the overlapping green segment), since these form the bulk of those colleges' incoming students. Since we can distinguish these students with our data, we focus on them separately from the 17,685 Cohort A students who started college well past high school graduation.

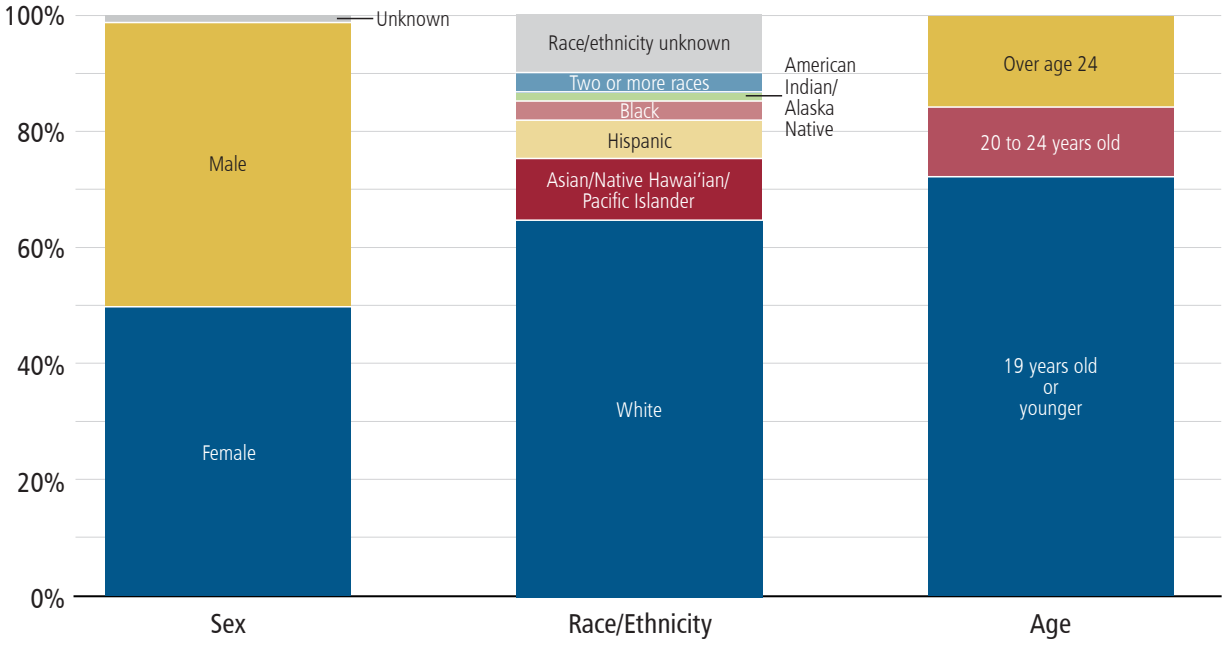
The second point of Figure 2 relates to several distinctions in the students in Cohort B. To reiterate, almost half of the students covered by Cohort B came from the public high school graduating Class of 2005 in the MLDE states (the 71,386 students in the green segment). The dotted portions of Cohort B highlight the presence of students who came from outside any of the four MLDE states, and may have been recent high school graduates, or first-time college students of any other age. The vast majority of remaining students in Cohort B are students from the MLDE states who were not recent public high school graduates.

The preceding discussion is an attempt to clarify the broad categories of students in the cohort and the subsets of students we use for the various results we present. Of course, the underlying number of students in any set of results can sometimes vary from the high-level numbers in Figures 1 and 2 and in Table 1, as we restrict a given analysis to the most appropriate subset of students based on

the data available. We provide detailed information in the table and figure notes accompanying each set of results, about the respective groups of students, and other important information about the underlying data is available in Appendix A: Technical Details.

Figure 3 depicts the demographic characteristics of the students in the cohort. One-half of the students are female (50 percent). Almost two-thirds of the students are characterized as White (65 percent).[3] Almost 75 percent of all students in the cohort were 19 years old or less when we first begin tracking them, another 12 percent were between 20 and 24 years old, with another 15 percent being older than 24 years of age. By design, virtually all students in the Class of 2005 high school graduate cohort were 19 years or younger at the time the cohort was constructed (a small number were older, which may indicate they were captured in the Class of 2005 cohort because they completed a GED or other non-standard diploma).[4] Almost two-thirds of the Cohort B first-time college students who were not also a Class of 2005 high school graduate from these states were 20 years or older when they began their college studies (64 percent).

Figure 3. Demographic Characteristics, All Students in the Cohort



Notes: Percents among all 192,689 students. Age is at high school graduation for Cohort A; age when first enrolled in postsecondary education for Cohort B. See endnote 2 for information about race/ethnicity classifications.

Participation and Success in Postsecondary Education

The results presented in this section are based on the public postsecondary institution enrollments and award data exchanged by the states, supplemented with similar data that the National Student Clearinghouse provided for students in the cohort who attended private non-profit postsecondary institutions or an institution in any of the other 46 states (and D.C.). The enrollments and awards data covered six years, from April 2005 to August 2011; thus we refer to college participation and completion over the six-year period.

Enrollment and Participation in College: First-Time College Students

Eighty-four percent of all the students in the total combined cohort enrolled in college at least once, 162,651 students. No evidence of postsecondary participation was found for 30,014 of the 119,085 high school graduates during the six years we tracked students, which amounts to 25 percent of the states' Class of 2005 public high school graduates and about 16 percent of all students in the study. Table 2 summarizes several enrollment patterns.

Across the MLDE four states, students were substantially more likely to start their college education in a two-year institution. Two-thirds of the students who began college enrolled exclusively in a two-year institution in their first term (64 percent). About half as many started in a four-year institution (34 percent). But it is also clear that many of these students had only a fleeting exposure to college. Twelve percent of the students in the total cohort who enrolled in college enrolled for only one term; seven percent of the high school graduates cohort and 20 percent of the first-time college student cohort. The vast majority of those who enrolled only once did so at a two-year institution (88 percent); the high school graduates at a lower rate than the other first-time college students in the cohort, 76 percent and 94 percent, respectively.

Table 2. Basic Enrollment Patterns, Overall and by Cohort[5]

	Cohort A Class of 2005 High School Graduates	Cohort B First-Time College Students Not From Cohort A	Cohorts A + B Combined
Number of students	119,085	73,546	192,689
Enrolled in college at least one term	75 %	100 %	
Initial enrollment was in-state	78 %	unknown	unknown
Enrolled only one term	7 %	20 %	12 %
Initial Enrollment Sector			
2-yr	52 %	79 %	64 %
4-yr	47 %	17 %	34 %
Both	1 %	1 %	1 %

Notes: Since we did not conclusively know the state of residence for Cohort B students immediately prior to their first college enrollment, we cannot determine whether their initial enrollment was 'in-state' or not. 'Both' refers to students who enrolled in more than one institution in their first observed term.

Of course, a number of these students may not have had any intention of pursuing a degree. We constructed the cohort to capture all first-time students, including both those who were degree-seeking and those who were not, and requested data to be able to distinguish them. However, due to the pilot nature of the study (and perhaps, in part, due to inherent difficulties with conclusively determining who is seeking a degree), there was a lack of clarity from the data as to what students actually intended or were pursuing. We considered several different approaches to determining whether students were degree-seeking, none of which accomplished what we needed, but in some cases provided some interesting information. We therefore include all students in this analysis (specifically, those who only enrolled once will be included in the results of those who didn't complete a degree). Based on our analysis, there are not notable differences among those who only enrolled only once by race/ethnicity. See Appendix A: Technical Details for more information.

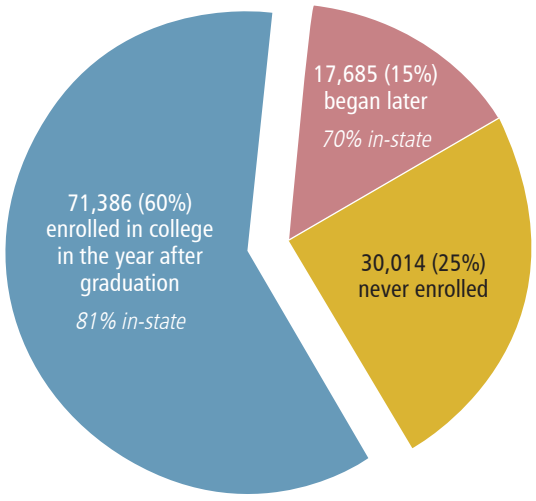
Enrollment and Participation in College: Cohort A, Class of 2005 High School Graduates

We are able to analyze some patterns for the Cohort A Class of 2005 high school graduates that we cannot for the Cohort B first-time college students. We know where and when Cohort A students graduated high school, but we do not know this information for Cohort B first-time college students who were not also among the Cohort A high school cohort. So, for example, we can describe where Cohort A high school graduates went to college compared to where they graduated high school, but for Cohort B we cannot compare their college patterns based on their high school graduation state. Rather, mobility patterns for Cohort B are based on where they first entered college. As another example, we know from the birth date data that 35 percent of the Cohort B students who were not also among the four states' Cohort A high school graduates were 19 years old or younger when they first appeared in our college enrollment data. So, we can hypothesize that many of these students enrolled within a year of their high school graduation. By definition, these individuals should have originated from outside the four Exchange states or have been graduates of private high schools within the four states, since they were not among Cohort A Class of 2005 high school graduates.[6] However, we do not know this with certainty, and therefore is it infeasible to analyze Cohort B students' behavior with the same interpretation or in as much detail as we do for the high school graduate cohort.

Figure 4 displays several college enrollment results among the Exchange states' 119,085 Cohort A Class of 2005 public high school graduates, including whether they enrolled in college, within how long from their high school graduation, and whether it was in the state they graduated high school or not. Seventy-five percent of Cohort A high school graduates engaged in some type of postsecondary activity in the six years we tracked them (89,071 students).[7] Sixty percent started within about a year after graduating high school (71,386 students), in academic year 2005-06, while an additional 15 percent started after 2005-06 (17,685 students). Twenty-five percent of the four states' Class of 2005 high school graduates were not found enrolled in college at any point in the six years after high school graduation (30,014 students).

Seventy-eight percent of the Class of 2005 high school graduates who attended college at least once within six years after high school graduation began at an in-state institution regardless of whether they started directly after graduation or later. Slightly more of those beginning within the year after graduation began in-state compared to those who started later, 81 percent and 70 percent, respectively. And, slightly more than a majority,

Figure 4. Cohort A, Class of 2005, High School Graduates College Enrollment



55 percent, of the Class of 2005 high school graduates who engaged in college in these six years were found to remain or be back in the state having earned a degree, working, or still enrolled through the end of the six years.[8]

Given rising pressures on public institutions to recruit out-of-state residents,[9] information about where recent high school graduates enroll, and whether they persist as nonresidents, is of growing interest. Table 3 presents a broader perspective of the enrollment patterns of the four states' high school graduates who went to college – whether the high school graduates ever enrolled out of state, and if so, did they ever return to their high school state for postsecondary studies? One-third of college students from Cohort A had postsecondary activity outside their state of high school graduation (30,233 students). Of these, more than one-half had activity both out-of-state and in-state (55 percent, or 16,602 students). Just over a third of these started out-of-state, but returned to their home state for college studies at some point. The data we had also made it possible to look at where high school students enrolled based on their race/ethnicity. In this cohort there were no discernible differences among the 8,633 students of minority race/ethnicity in whether they initially enrolled in- or out-of-state.

Table 3. Cohort A, Class of 2005 High School Graduates' College Enrollment Patterns by State of Attendance

	Students	Percent
Had only in-state postsecondary activity	58,834	66%
Had only out-of-state postsecondary activity	13,631	15%
Had both in- and out-of-state postsecondary activity	16,602	19%
Started in-state but had postsecondary activity out-of-state	10,487	12%
Started out-of-state but had postsecondary activity back in-state	6,115	7%

Note: Among 89,071 Cohort A students who ever enrolled in a postsecondary institution.

More information about the high school graduates' mobility patterns can be found in the section "**Mobility: Location of Employment and Further Enrollment Among Degree-Earners**."

Also, since we are dealing with the universe of the four states' high school graduates, we can compare college-going rates by student demographics:

- Male high school graduates enrolled in college at lower rates than females, 72 percent compared to 78 percent.
- High school graduates who are underrepresented minorities enrolled at lower than average rates – 78 percent of Whites and 76 percent of Asian/Native Hawai'ian/Pacific Islander high school graduates enrolled overall, compared to an average 65 percent of students of American Indian/Alaska Native, Black or Hispanic origin. (However, among Hawai'i students, those who were specifically indicated as Native Hawai'ian were less likely to enroll than others in the Asian/Native Hawai'ian/Pacific Islander category, 55 percent and 79 percent, respectively.)

Enrollment and Participation in College: Areas for Further Investigation

There are a number of other topics that would be of interest to policymakers that can be explored using the wealth of enrollment data made available through

the MLDE. For example, knowing which students were high school students immediately before they showed up in the college enrollment data makes it possible to identify students who participated in concurrent/dual enrollment. In some cases such as Washington's Running Start, this could be a substantial number and of particular interest in terms of the outcomes of those students.[10] These more comprehensive, student-level longitudinal enrollment data also make it possible to look at student 'swirl' and transfer across institutions, as the National Student Clearinghouse (NSC) has done.[11] Policymakers would be interested in how these patterns relate to whether a student completes a degree, in what timeframes and with what implied public investment, among other things. Since the NSC has committed considerable effort to analyzing student swirl, transfer, etc., we devoted more attention to examining enrollment and completion patterns that varied along dimensions the NSC is less able to examine, such as by race/ethnicity, Pell status, and state of residence. Nevertheless, the data available in the MLDE does open the possibility for any of the states who now have the data to perform this type of individual-level analysis.

Degree Completion: First-Time College Students

Table 4 presents degree-completion outcomes for all college students, separately for Cohort A Class of 2005 public high school graduates and Cohort B first-time college students who were not public high school graduates of the states. Results are shown for any student who was ever observed to be enrolled at least once during the six years of the study from April, 2005, to August, 2011 (157,606 students; 5,045 students who started too late in the six years covered to have enough time to complete at least an Associate's degree are excluded from the degree completion rate).

Table 4. Highest Degree Completed, All First-Time College Students

	Students			Percent		
	All Students	Cohort A	Cohort B	All Students	Cohort A	Cohort B
Bachelor's Degree or Higher	42,966	31,206	11,728	27%	37%	16%
Associate's Degree	16,439	8,645	7,788	10%	10%	11%
Certificate	4,004	1,390	2,614	3%	2%	4%
Still Enrolled	18,269	9,209	9,052	12%	11%	12%
No Degree	75,928	34,431	41,487	48%	41%	57%
Total	157,606	84,881	72,669			

Note: 5,045 students who started too late to complete at least an Associate's degree in six years are not counted in this table. Among those who completed a Bachelor's degree or higher, 3,395 completed a post-baccalaureate or graduate's degree. 4,239 students who completed an Associate's degree or higher also completed a sub-baccalaureate certificate.

Overall, 37 percent of the college students in the cohort (59,405 students) graduated with at least an Associate's degree during the six years we tracked outcomes, through August, 2011.[12] For 28 percent of these college graduates, the highest degree they completed in these six years was an Associate's degree; 72 percent completed a Bachelor's degree or higher. Degree-earners from Cohort A were more likely to have completed a Bachelor's degree or higher compared to degree-earners from Cohort B. Baccalaureate degrees were 78 percent of the degrees earned by Cohort A students and 60 percent of Cohort B.

Table 4 also provides some sense of what happened with the students who did not complete at least an Associate's degree in six years (63 percent overall). About 12 percent of all first-time college students were still enrolled at the end of the six years (indicating they may still have been pursuing their studies), at about the same rates for both Cohort A and Cohort B students. Sixty percent of these still-enrolled students were enrolled at a two-year institution and 39 percent at a four-year institution.[13] And, even though we acknowledge the value of sub-baccalaureate certificates, we do not count students whose highest award was a certificate as degree-completers for these results, because of difficulties identifying and defining certificates of lesser or greater value (See Appendix A for more detail). About 3 percent of college students who did not complete at least an Associate's degree in six years, did receive at least one certificate, slightly higher among Cohort B students (4 percent) than Cohort A (2 percent). Forty-eight percent of the first-time college students stopped without completing a degree, receiving a certificate, or being enrolled at the end of the study.[14] Cohort B students stopped without completing at higher rates than Cohort A students, 57 percent and 41 percent, respectively.

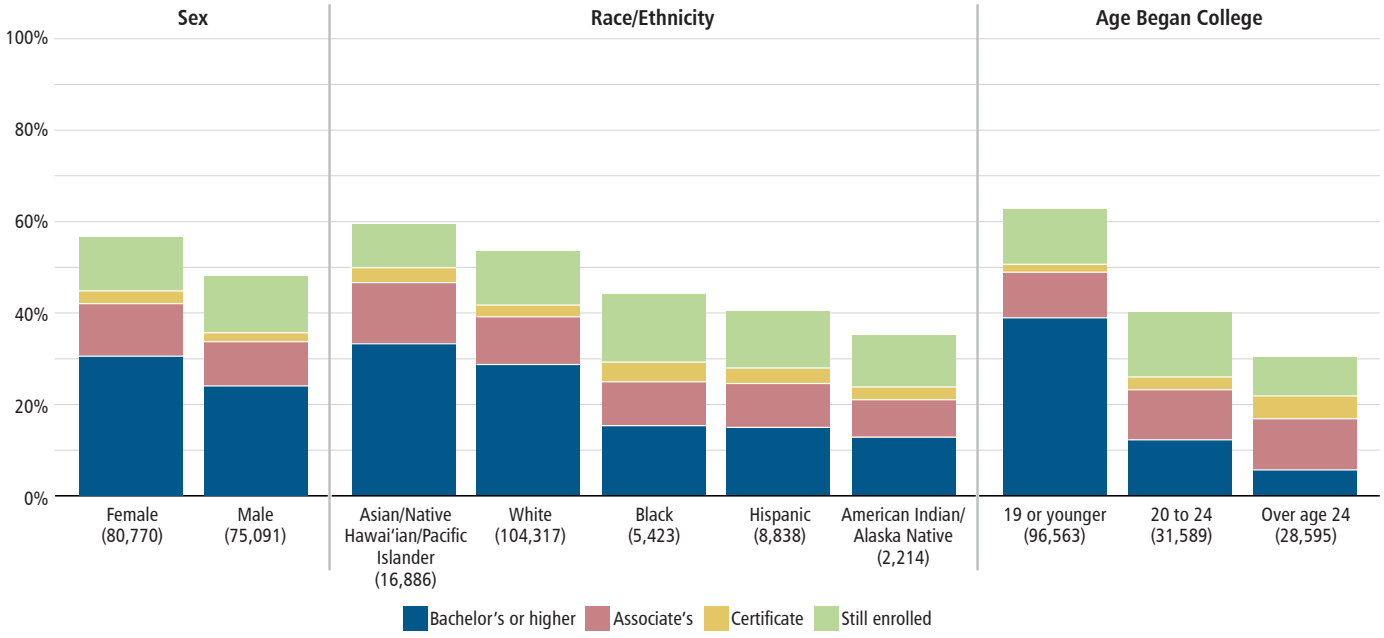
Finally, 7 percent of those who earned an Associate's degree or higher also earned a sub-baccalaureate certificate of at least two years in length. Almost three-quarters of these additional certificates were among Associate's degree-earners (73 percent).[15]

Degree Completion: Student Characteristics

Now we look at whether there were differences in students' degree completion in these four states tied to demographics and other factors. The characteristics that we were available to analyze were the students' sex, race/ethnicity, age, and whether they ever received a Pell award. Figures 5, 6, and 7 display the degree completion results for all of the college students overall (results for Cohort A and Cohort B students are presented separately in subsequent sections). As shown in Figure 5, slightly more female students than male students completed a degree, with a notably higher rate of female students completing a Bachelor's or higher compared to males, 30 percent compared to 24 percent, respectively. Asian/Native Hawai'ian/Pacific Islander and White students were most likely to complete a degree, 46 percent and 39 percent, respectively, compared to about 25 percent of students who are Hispanic or Black. Not surprisingly, students who started college by age 19 were most likely to complete a degree within the six years, 39 percent completing a Bachelor's or higher degree and another 10 percent completing an Associate's. Degree completion among students who started at older ages drops significantly.

Public policymakers are interested in understanding the success of low-income students and students receiving grant aid. But this issue remains one of the most challenging to examine due to variation over time in individuals' income and in financial aid application rates and inconsistencies in financial aid programs. Most researchers settle for receipt of Pell grants as the best available proxy for income, but there are few data sources that provide this variable. Including a flag for Pell receipt in the MLDE was an obvious way to get better information to understand how well their institutions were serving such students. We were able to analyze the postsecondary outcomes of 78,188 of our 157,606 students along this dimension.

Figure 5. All First-Time College Students: Highest Degree Completed, by Student Characteristics

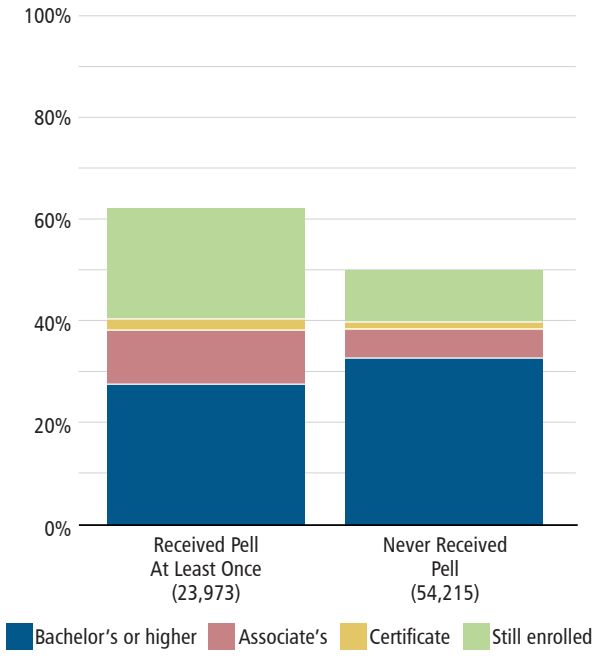


Notes: Highest degree completed during the six years the students were tracked, among the 157,606 students who ever enrolled at least once in a post-secondary institution. Results not displayed for the 5,045 students who enrolled but did not start soon enough to complete a degree; for students whose sex was not indicated (1,900); students whose race/ethnicity were of multiple races (5,600), or not indicated (14,400); and students whose birth date was not provided (860).

Figure 6 shows degree completion among those who received a Pell award at least once compared to those who never received a Pell award.[16] Those who received a Pell award at least once were somewhat less likely to complete a Bachelor's or higher degree compared to those who never received Pell, 28 percent and 33 percent, respectively. On the other hand, Pell recipients were almost twice as likely to have completed an Associate's degree or still be enrolled after six years.[17]

Our analysis also revealed that students' receipt of Pell grants was not always consistent across all enrollment terms. To get a sense of how the "intensity" of Pell receipt was related to degree completion, we tallied the percent of

Figure 6. All First-Time College Students: Highest Degree Completed, by Pell Receipt

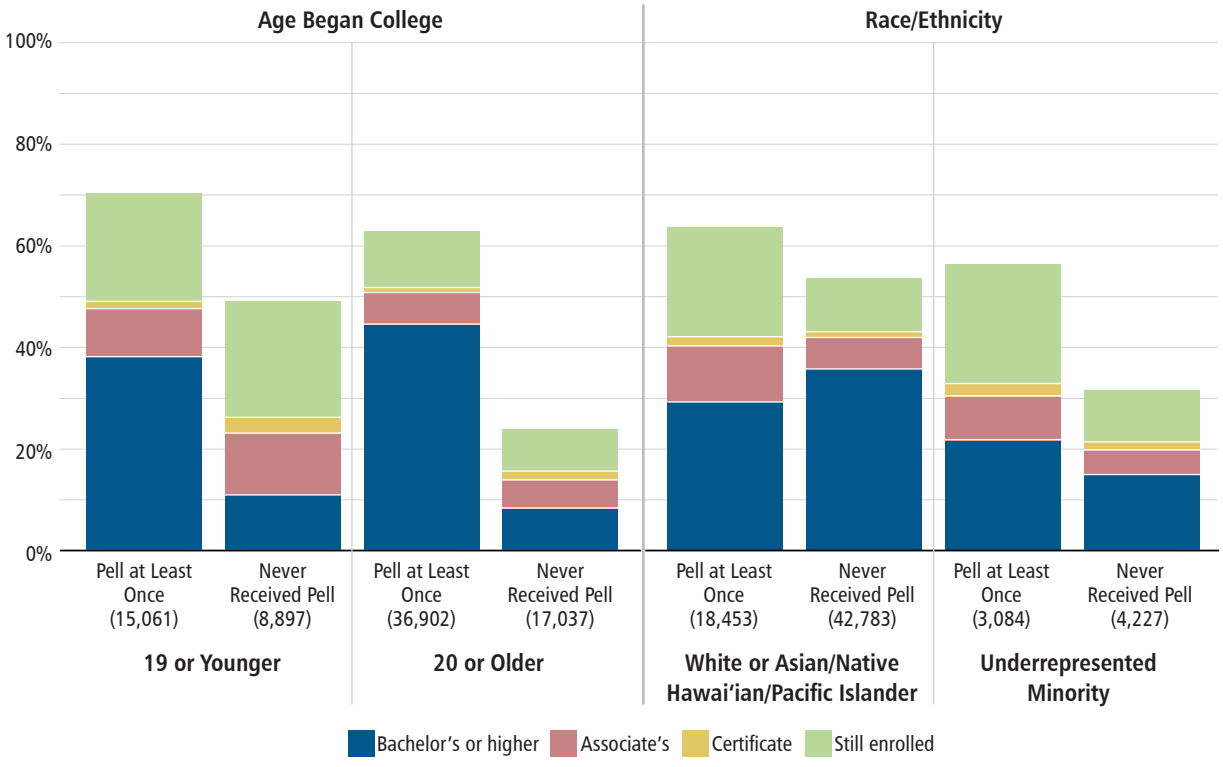


Notes: Highest degree completed during the six years the students were tracked, among the 157,606 students who ever enrolled at least once in a post-secondary institution, and not including the 5,045 students who enrolled but did not start soon enough to complete a degree are not included, for whom Pell indicators were available.

terms Pell was received among 13,000 students who ever received a Pell grant and for whom we could reliably compare their Pell receipt to the number of Fall and Spring terms in which they enrolled. That analysis indicates that students who received Pell for 50 percent or more of their enrolled semesters were less likely to complete a degree in six years (results not charted).[18]

Figure 7 summarizes degree completion results when several student characteristics are taken together, specifically, whether the student ever received a Pell award in combination with age and underrepresented minority race/ethnicity, common indicators of a nontraditional student.[19] Figure 7, left chart, shows that older students who received Pell were far more likely to complete a degree than those who did not receive Pell, 50 percent and 13 percent, respectively. However, similar differences are seen, to a lesser extent, among younger students. Also, the higher rate of Pell receipt seen here probably influences the finding that students who received Pell are less likely to complete in overall terms (see Figure 6), because the majority of students who received Pell in this analysis are older (47 percent) and older students complete degrees at lower rates overall, as shown previously (see Figure 5). Among students of underrepresented minority race/ethnicity, those who received Pell at least once were more likely to complete or still be enrolled than those who never received Pell (Figure 7, right side).[20]

Figure 7. All First-Time College Students: Highest Degree Completed, by Pell Receipt



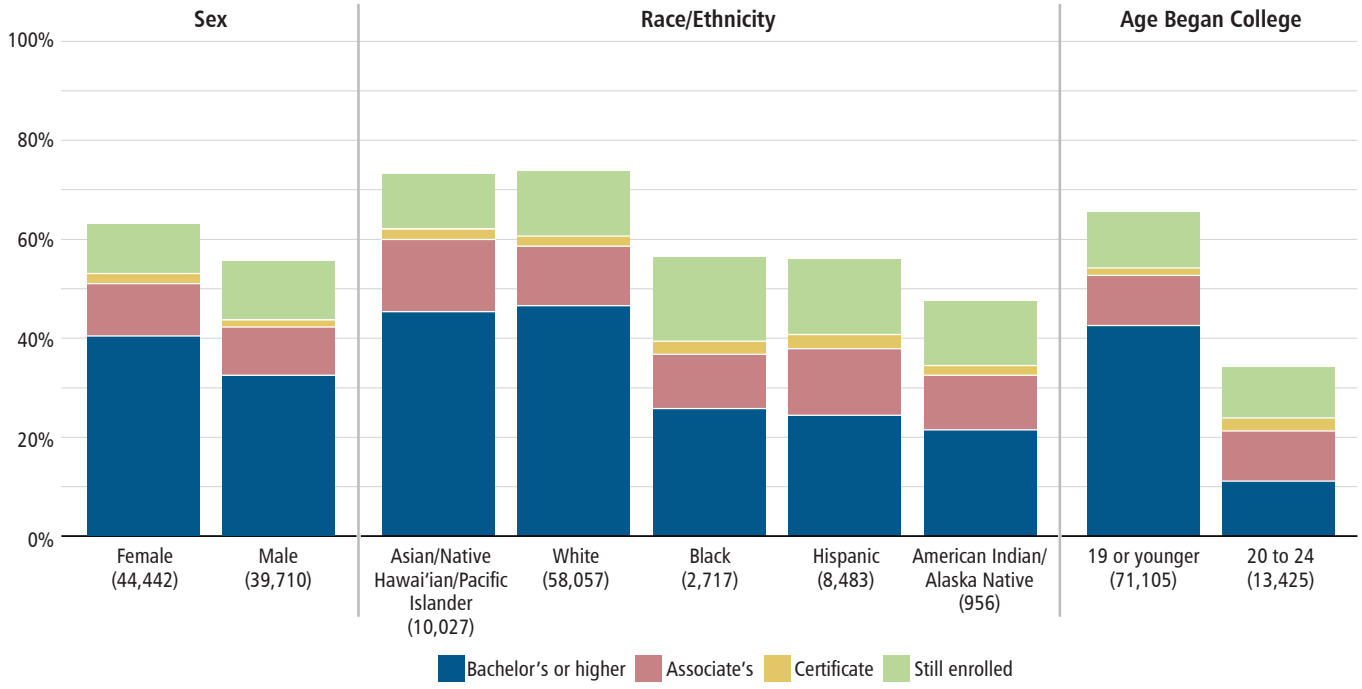
Notes: Highest degree completed during the six years the students were tracked, among the 157,606 students who ever enrolled at least once in a post-secondary institution. The 5,045 students who enrolled but did not start soon enough to complete a degree are not included. 'Underrepresented minority' includes students whose race/ethnicity is American Indian/Alaska Native, Black or Hispanic; students whose race/ethnicity were of multiple races (5,600) or not indicated (14,400), and students whose birth date was not provided (860), are not included in results.

Degree Completion: Cohort A, Class of 2005 High School Graduates

One virtue of this data exchange is being able to focus attention on a cohort of high school graduates based on their home state. It is plausible to expect that there might be very different outcomes for students who graduated high school recently in-state, compared to those who either came from out of state to attend college or who delayed their college studies after high school graduation. Our cohort definitions help us begin to look at these differences in outcomes.

Figure 8 presents the college degree completion rates among the Cohort A Class of 2005 high school graduates who enrolled in college at least once by several student demographic characteristics. Overall, more than one-third of college students from Cohort A earned a Bachelor's degree or higher (37 percent), and 10 percent earned an Associate's degree; an additional 2 percent earned at least a certificate. About 15 percent of the Cohort A high school graduates either enrolled for the first time too late to have earned a degree (5 percent) or were still enrolled after six years (10 percent). As shown in Figure 8, female students were more likely to earn a degree than males, particularly Bachelor's or higher degrees.

Figure 8. Cohort A, Class of 2005 High School Graduates' Degree Completion, by Student Characteristics



Notes: Highest degree completed during the six years the students were tracked, among the 89,071 high school graduates who ever enrolled at least once in a postsecondary institution. Results not displayed for the 5,045 students who enrolled but did not start soon enough to complete a degree. Also not included are students who did not fall into the categories for each grouping: 1,439 students whose sex could not be determined from the available data; 8,641 students whose race/ethnicity was not specified or was two or more races; and 350 students who started college at age 24 or older.

As shown in Figure 8, White and Asian/Native Hawai'ian/Pacific Islander high school graduates in the cohort earn Bachelor's or higher degrees at almost twice the rate of students of other race/ethnicity, 38 percent compared to between 18 and 22 percent, respectively. And, high school students who started college at age 19 or younger (by definition, this is almost synonymous with students who started within the academic year after graduation from high school) were far more likely

to complete a Bachelor's or higher degree than those who started later. Forty-two percent of those who started within the year after high school graduation completed a Bachelor's or higher degree, compared to 11 percent of those who started at age 20 to 24. Some of this may have to do with the latter group of students who delayed starting college having less time to complete a four-year degree, but it may also reflect different degree aspirations between the groups.

Degree Completion: Cohort B, First-Time College Students Who Were Not Class of 2005 High School Graduates of the Exchange States

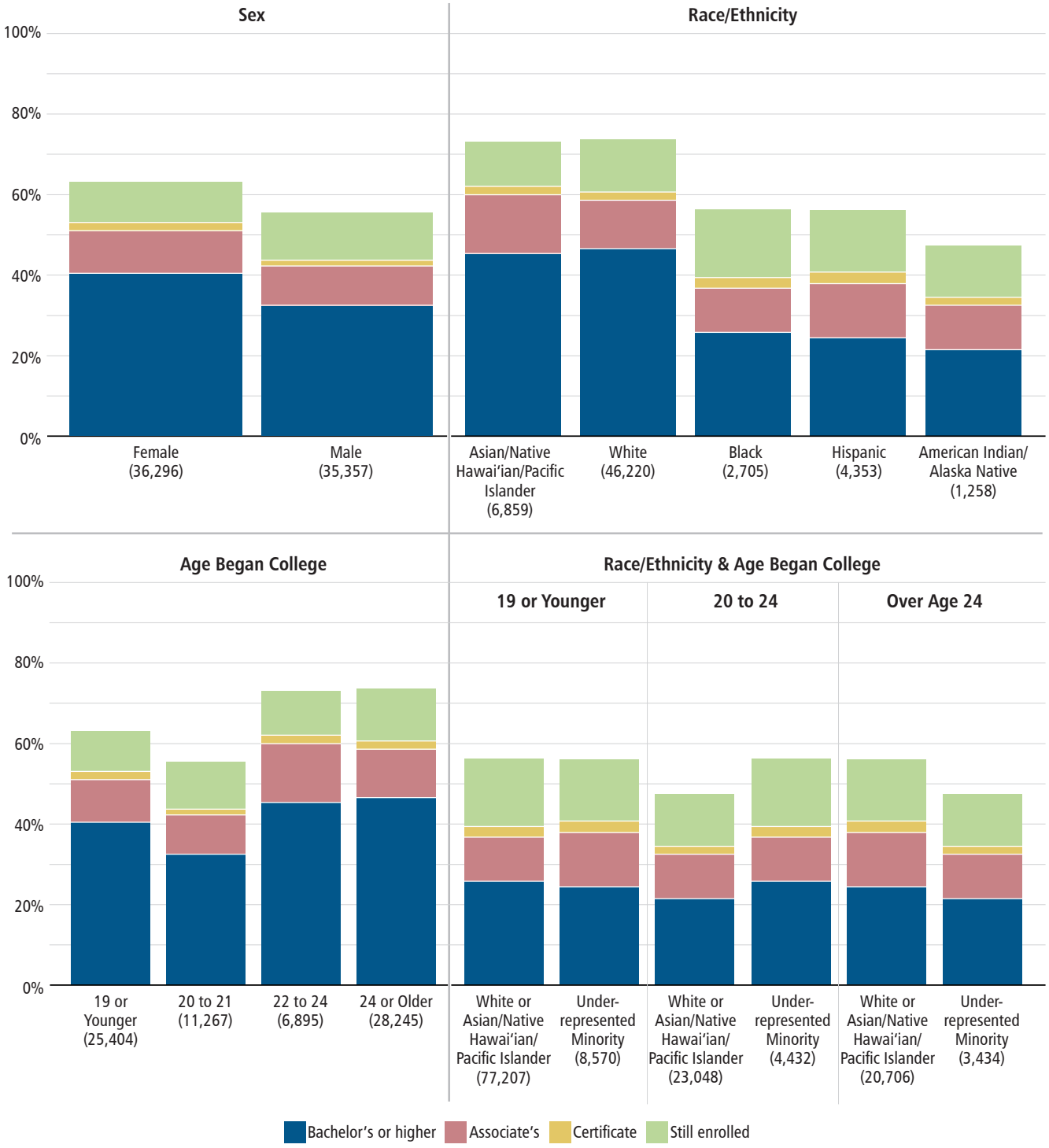
In contrast to those students from Cohort A who went directly to a public institution in one of the four states, Cohort B captures students who came from out of state to attend college or who enrolled for the first time as adult learners. Figure 9 (next page) shows degree completion among these 72,669 Cohort B first-time college students broken out by the same student characteristics as the previous findings: sex, race/ethnicity and college-starting age. As described above, this subset of Cohort B college students were overall less likely than Cohort A students to complete a Bachelor's degree or higher in six years. This appears to hold true regardless of the student's sex or race/ethnicity. As with the total group and among the Cohort A students, Cohort B females were more likely to complete degrees than males (40 percent and 23 percent, respectively), and Cohort B students of Asian/Native Hawai'ian/Pacific Islander and White origin were substantially more likely than students of a minority race/ethnicity to complete a degree (42 percent among Asian students, 37 percent among White students, and 18 percent among Black, Hispanic and American Indian/Alaska Native students).

There was a substantial portion of Cohort B that was 19 years or younger when they started college; presumably these were students who came directly to college from high school but from out of state or from private high schools.[21] But these younger Cohort B students who started college by age 19 had lower completion rates than the corresponding traditional age college students from Cohort A – fewer completed at least an Associate's in six years compared to Cohort A, 52 percent and 41 percent, respectively. Degree completion drops among the more substantial number of students in Cohort B who were older when they started college, i.e., older than the traditional college-starting age of 18 or 19 – to 25 percent among students who began at age 20 to 24 and 16 percent among those who didn't start until age 25 or older. This decrease in degree completion rates among older, first-time college students reflects what is seen for college students overall and for Cohort A students. However, Cohort B students of all age groups were about 5 percent more likely to still be enrolled after six years and slightly more likely to have earned at least a certificate than were students overall and the Cohort A students.

Mobility: Where Graduates Are Found Working or Seeking Further Education

In this section, we describe some of what we can know from this extensive dataset concerning where college students earn a college degree and where they are found working after graduation. It can be helpful to policymaking to know which degree recipients remain in state after getting their college degree, who leaves the state after graduation, where they go, and how do their earnings or employment

Figure 9. Cohort B Completion, by Student Characteristics



Notes: Among 72,669 Cohort B first-time college students who were not also among the four states' Cohort A public high school graduates. Not included are the 853 students who started too late to complete at least an Associate's degree.

activity compare. For these findings we only present a snapshot of where students in the cohort were found working about a year after they received their degree. There are, of course, many other aspects of student behavior and mobility that might benefit policymaking that can be analyzed with these data, such as how long students stay or where they can be found at different points in time.

There are multiple permutations of where students came from, where they attended or completed college, and where they end up employed. The reader should be aware that the underlying subset of students continually changes to be relevant to the specific analysis. We begin with all students from either Cohort A or B who completed a degree, all states combined, and present:

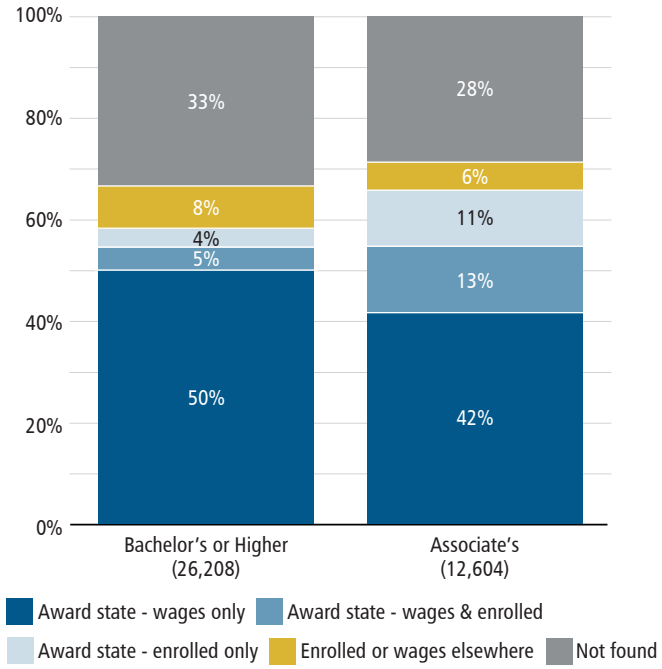
- *Where we found these college degree-earners at about 12 months after they received the highest degree they completed in six years*. In the first set of results below, the 'where' of the graduates' mobility is defined relative to where they earned their college degree. We looked at about one year (10-12 months) after they received the degree, because earnings immediately after graduation may not be as accurate a reflection of the graduate's longer-term employment.[22]
- *Whether the degree-earner was found working*. A student is considered to be 'working' if an earnings record was found for them in a state's quarterly wage reports data, either working in the 'Award state' or 'Elsewhere' if earnings data were found in one of the other Exchange states. Those for whom earnings data were not found in one of the four states are included in the 'Not found' portion of the results.
- *And, whether the degree-earners were found enrolled at the time that we found them working*. We present the students' post-degree enrollment status for two reasons. First, to set the stage for looking at earnings outcomes in following sections, in which it is very important to account for whether the student is enrolled while working when interpreting their earnings outcomes. Second, this information is helpful to demonstrate the additional data that can be found by virtue of this data exchange – many of the students in the 'Elsewhere' portion of the results were found enrolled somewhere outside the state from which they received their award. This is important additional information when looking at post-degree outcomes – both for testing the project assumption that sharing data among states helps more fully account for individual mobility across state lines – but also for policymakers grappling with accountability issues, economic development, and the like.
- We refer to individuals for whom earnings data were not found, as 'not found', rather than 'not working,' because we cannot say with certainty that someone is not working (at all or in a given state).

Readers should consult the Appendix A: Technical Details for detail about this analysis and the data that were available to conduct the analysis.[23]

Location of Employment and Further Enrollment Among Degree-Earners

Beginning from all the students from either Cohort A or B who completed at least an Associate's degree (the 59,405 degree-earners presented in Table 5 above), it is necessary to refine our subset of students to arrive at the most appropriate results for employment and mobility analysis. Therefore, we limit our analysis for Figure 10 and Figure 11 to the 38,812 students who received their degree from one of the four MLDE states and met two conditions necessary for our employment analysis – that their degree was earned early enough to allow for at least 12 months post-degree earnings analysis, and that we received the necessary data to search for

Figure 10. Location of Work and Education Approximately 12 Months After Degree Was Awarded, Associate's Degree or Higher Earned from an MLDE State by December 2010, Overall



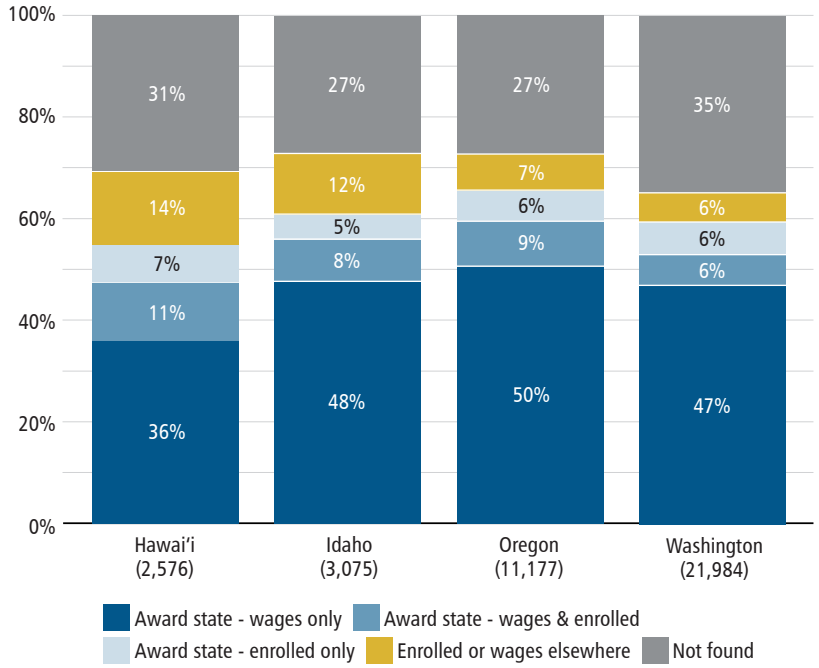
Notes: Among students who completed a degree of Associate's or higher by December 31, 2010 from one of the four MLDE states, for which necessary data were available to search for earnings.

them in earnings data. As shown in Figure 10, 59 percent of those who earned a Bachelor's degree or higher were found in the state where they earned their degree about 12 months after it was awarded – 50 percent were found only working and not enrolled at the same time, 5 percent were found concurrently working and enrolled, and 4 percent were found only enrolled at that point. Another 8 percent were found working or enrolled (in any combination) somewhere outside the state from which they earned their degree. Slightly more Associate's degree-earners overall were found at about 12 months post-degree, but in different location/working/enrollment proportions. Two-thirds of Associate's degree-earners were found in the state they earned their degree – 42 percent were found only working, 13 percent were found concurrently working and enrolled, and 11 percent were found only enrolled at that point. Another 6 percent were found working or enrolled (in any combination) somewhere outside the state from which they earned their degree.

Figure 11 presents the same type of analysis as presented above with Associate's and Bachelor's or higher combined, by the state in which students earned their degree. Clearly, policymakers of a given state are more interested in what happens with the college students who were active in their state than the 'regional' view. A variety of things might explain the variability that is seen in each state below, including differences in student composition, labor market differences, geographic location and proximity to the other states involved, and to some extent the scale of the number of students represented. For example, Figure 11 indicates that college graduates from Hawai'i are less likely to be found in-state about a year after graduation, compared to college graduates of the other states. This also indicates

that Hawai'i stands to benefit more from exchanging data with other states since a higher percentage of Hawai'i graduates are found outside the state.

Figure 11. Location of Work and Education Approximately 12 Months After Degree Was Awarded, Associate's Degree or Higher Earned from an MLDE State by December 2010, by State



Note: Among students who completed a degree of Associate's or higher by December 31, 2010 from one of the four MLDE states, for which necessary data were available to search for earnings.

There were also 7,851 students who received a degree outside one of the MLDE states, 1,071 received an Associate's degree and 6,780 a Bachelor's degree or higher. Awards from a California institution accounted for 27 percent of these degrees (414 Associate's degrees and 1,742 Bachelor's degrees), and another 25 percent were issued by institutions in Arizona, Utah, New York and Montana combined (in order by number of degrees). Almost two-thirds of these students started their studies outside an MLDE state; 36 percent started in an MLDE state and completed their studies elsewhere. Thirteen percent of these students who earned degrees outside the MLDE states were found employed back in one of the four MLDE states within 12 months after their award (1,002 students); further evidence of the value of the MLDE for participating states, and even for states not contributing data who might want to know the outcomes of their college graduates.

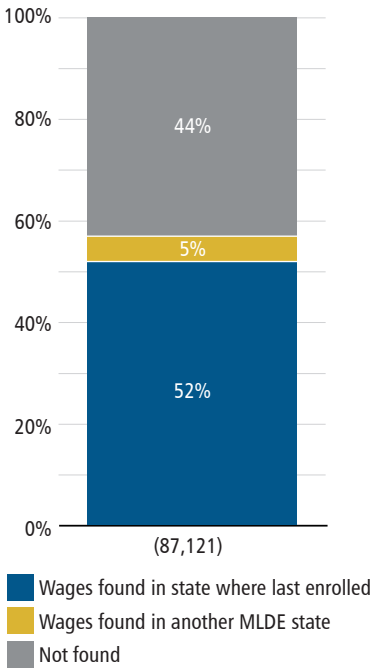
Location of Employment Among College Students Who Did Not Complete a Degree

It is also important to try to understand what might have happened with college students who did not complete a degree, such as whether they moved elsewhere for college or work. Figure 12 presents one aspect of what could be found about college students who stopped out without completing a degree – whether and where they are found employed after they stop attending college. Whereas

for degree-holders we looked for employment at about a year after they received their degree, for students who did not complete a degree we look for employment over a shorter timeframe. We looked for employment in the wage quarter just after the term the student was last found enrolled because, for example, employment may be a primary reason students stopped their studies (whether in the same state as their college or elsewhere). Also, while we analyzed degree-earners' earnings at about a year out, to leave sufficient time to transition to work that is presumably related to their field of study, we are conceptually less concerned with this for students who did not finish their degree.[24]

The majority of college students who didn't complete a degree but were found employed, were working in the state where they were last enrolled (by definition, one of the four Exchange states). We also found 5 percent of these non-degreed students among the wage-earners of another of the four Exchange states, which may indicate that the students moved on to another Exchange state soon after their last enrollment.

Figure 12. Where Students Who Did Not Complete at Least an Associate's Degree by December 2010 Were Found Working After Their Last Enrollment



Notes: Among students who did not complete a degree in six years and for whom necessary data were available for earnings analysis. Includes students who earned only a certificate or were still enrolled at the end of six years. Students who completed a degree after December 31, 2010, but before August 31, 2011, are not included.

Location of Employment and Further Enrollment Among Cohort A, Class of 2005 High School Graduates

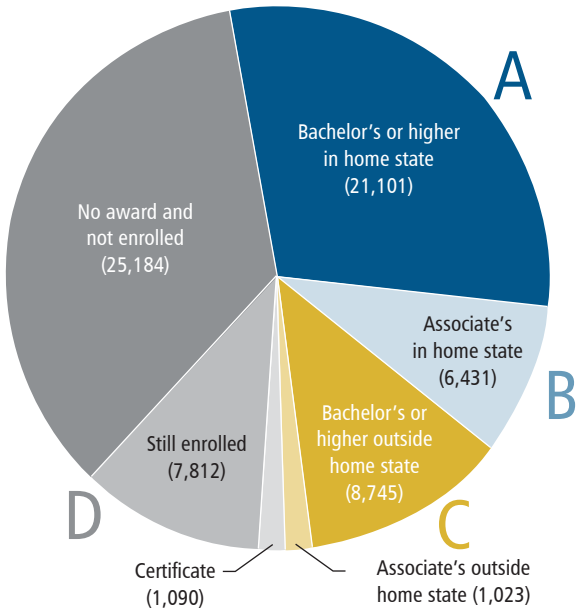
College students who were recent high school graduates of the state are the substantial bulk of most states' public college cohorts, and therefore command much of the public policy attention on college-going and success. It is particularly valuable to be able to identify these students and investigate whether they remained in-state to complete their college studies and then joined the labor force. So, we continue with an analysis of post-degree mobility for college students who were high school graduates from Cohort A. But since we know the state from which Cohort A high school graduates came, their mobility is defined as being found (or not), working and/or further enrolled in the same state as where they received their high school diploma, i.e., their 'home' state.

Cohort A Direct College-Going High School Graduates Who Completed A Degree

First we look at Cohort A high school graduates who went to college within the academic year after graduation from high school and refer to them as 'direct college-going'. Sixty percent of Cohort A high school graduates went directly to

college; that is, they were first found enrolled in academic year 2005-06 (about 71,400 students). As shown in Figure 13, 52 percent of these Cohort A direct-college going high school graduates completed at least an Associate's degree within six years (37,300 students); almost 75 percent of whom got the degree from the state in which they graduated high school. Specifically, 57 percent of direct college-going Cohort A students who completed a degree got a Bachelor's or higher degree in their home state of high school graduation (21,101 students). Bachelor's or higher degrees from out of state were the next most likely degree outcome (23 percent, 8,745 students), followed by the 20 percent who obtained an Associate's degree in or out of state (17 percent and three percent, respectively).

Figure 13. Highest Degree Completed, by Location, Cohort A Class of 2005 High School Graduates Who Went Directly to College



Notes: Among 71,400 Cohort A high school graduates who enrolled in AY2005-06. Highest degree completed in six years.

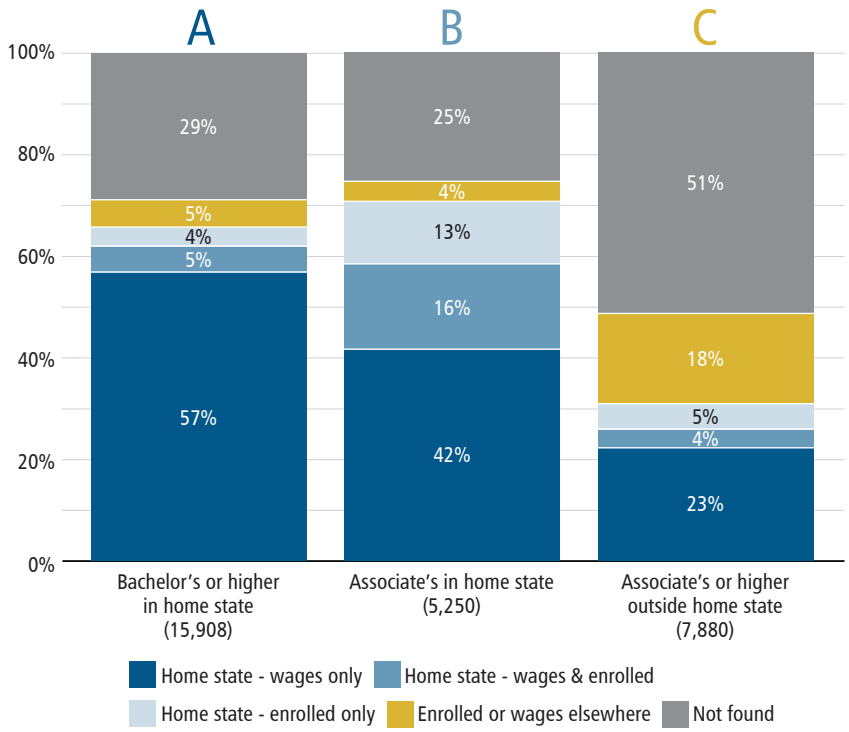
Among the baccalaureate degrees awarded by an institution in a state other than the student's home state, one-third were awarded by one of the other states involved in this four-state project. (Awards from private institutions in MLDE states were counted among the degrees awarded within each state.) The other two-thirds came from elsewhere, with California producing 25 percent of the Bachelor's or higher degrees not provided by one of the four Exchange states, and Bachelor's or higher degrees from Utah, Arizona, New York, and Montana contributing another 28 percent or 1,600 degrees (in order of number of awards). About 42 percent of Associate's degrees from out of state were awarded by one of the other states involved in the project, and 46 percent of those not conferred by one of the four MLDE states were from California.

In Figure 14, we present the mobility of these direct college-going high school graduates, here again focusing on whether (or not) the degree-earner was found working 10-12 months post-degree, and whether and where they were found enrolled. The student's location is compared to the state where they received their high school degree, which we refer to as the 'home state.' As previously, we limited this analysis to those students who earned an Associate's degree or higher by December 31, 2010, and for whom the data necessary were available to search for earnings data.[25] The columns in Figure 14 are labeled A, B and C to correspond with the portions of the pie slices in Figure 13.

Similar to the previous mobility charts, the blue column portions of Figure 14 show whether the student was found in their home state – only working, concurrently

working and enrolled, or only found enrolled. 'Elsewhere' in the gold column portions refers to being found working and/or enrolled (in any combination) somewhere outside the state of high school graduation. As shown in Figure 14, high school graduates who earned their Bachelor's degrees in the state of high school graduation were also the most likely to be found in state 10-12 months after they received their degree ('A' bar), followed by those who earned their Associate's degree in their home state ('B' bar). Direct college-going high school graduates who completed a Bachelor's degree or higher were more likely to be found working and not still enrolled compared to those who earned Associate's degrees – 57 percent and 42 percent, respectively. Fewer than one-half of direct college-going Cohort A students who completed degrees outside their state of high school graduation ('C' bar) were located 10-12 months after receiving their degree.

Figure 14. Location of Work and Education Approximately 12 Months After Completing a College Degree, High School Graduates Who Went Directly to College



Notes: Among MLDE states' direct college-going high school graduates who completed a degree of Associate's or higher by December 31, 2010, for which necessary data were available to search for earnings.

Cohort A Direct College-Going High School Graduates Who Did Not Complete A Degree

The gray portion of the pie chart in Figure 13 is the 40 percent of Cohort A direct-college going high school graduates who did not complete at least an Associate's degree within six years. These students may be of particular interest to policymaking focused on how to get more of these recent high school graduates to complete college. Here are a few additional pieces of information about these high school students who attended but did not complete college.

- About 1,100 of these Class of 2005 direct college-going high school graduates completed a sub-baccalaureate certificate but not a higher degree, which is about 3 percent of those who did not complete a degree.
- Almost one-quarter of these students who did not complete a degree within six years were 'still' enrolled at the end of the study period.[26] Among these states' Class of 2005 high school graduates who were still enrolled in college after six years:
  - Three-quarters remained enrolled in college in the state where they graduated high school.
  - Forty percent remained enrolled in one of the Exchange states' two-year institutions (about 3,800 students), while another 31 percent were in one of the Exchange states' four-year institutions (almost 2,500 students).
  - Fifteen percent were still enrolled after six years elsewhere in the nation (about 1,150 students), the majority of these at public two-year institutions (675 students).
- This leaves more than 25,000 Class of 2005 high school graduates who stopped out altogether without completing a certificate or degree and were not enrolled at the end of the six years.
  - About 15 percent of these high school graduates enrolled only one term. And 72 percent of these one-term enrollees began and ended their college studies at a two-year institution in the state where they graduated high school.
  - Among those who enrolled more than one term, 60 percent started and ended their studies among the four states' public two-year institutions, and 18 percent among the four states' public four-year institutions.
  - There are a variety of other student patterns among the other 4,800 direct college-going students who didn't complete, including those who pursued studies at a private institution, or changed institutions and sectors throughout the course of the six years.

Cohort A High School Graduates Who Delayed College

Figure 15 summarizes college degree completion among the Cohort A high school graduates who didn't start college within the academic year after graduation from high school, but started at some point later within the six years. The vast majority of these students who delayed their college studies initially enrolled at a public two-year institution in their home state, with roughly one-half of those within two years. The results in Figure 15 reiterate what we saw previously, which is that students who begin their postsecondary studies past the age of 19 have much less likelihood of completing a degree (in six years). Here, fewer than 20 percent of the Cohort A high school graduates who delayed college completed at least an Associate's degree in six years, much lower rates than the high school graduates who went directly to college. About the same proportion of these students were still enrolled at the end of the six years (2,653 students) as the proportion that completed their degree by then (2,926 students).

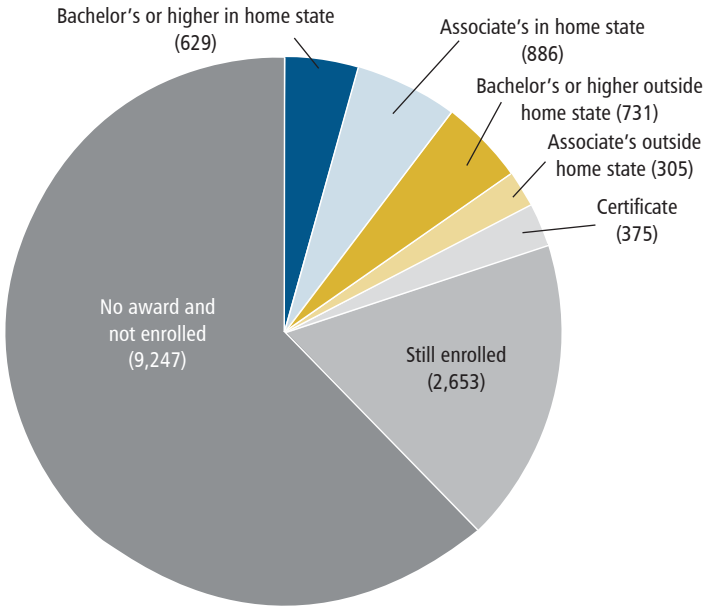
We do not present the post-degree mobility analysis for this subset of students, because there were substantially more students in this group for whom we did not

have the data necessary to search for them in earnings data, or who started college too late to analyze their post-degree activities.

The Value of Exchanging Data: Student Mobility

In addition to providing a sense of students' post-degree activity and mobility, the foregoing Mobility findings also hint at the value of having more information than what a state can discern from data limited to what it has at hand. The gold portions in the Mobility charts above portray the additional value of the exchanged data to the participating states' knowledge of what happened with their students.[27] There is significant value in finding employment information for more graduates, as seen in detail in the Earnings section that follows. But in many other ways, being able to find more students after they graduate, or those who left during their studies, can increase a state's certainty about their overall higher education outcomes. And the possibilities for policy- and practice-relevant information are not limited to these analyses; these data can provide many additional insights beyond earnings or movement out of state for education. For example, one could investigate which fields of study correspond with the highest staying or leaving rates and whether students are leaving for further studies or to work, among other things. To that end, Figure 16 focuses on how many more degree-earners can be found post-degree in one of the other three MLDE states' data if they were not found in the state's own systems of postsecondary or earnings data (further enrollments known by virtue of the data supplied by NSC are excluded). That is, how much more can the states know about the outcomes of their college graduates post-degree by being able to look outside the state's own systems – or, conversely, how much is uncertainty reduced.

Figure 15. Highest Degree Completed, by Location, Cohort A High School Graduates Who Delayed College More than a Year After Graduating High School



Notes: Among 14,826 Cohort A high school graduates who first enrolled after Summer 2006, and not including the 2,859 students who started too late to complete at least an Associate's degree. Highest degree completed in six years.

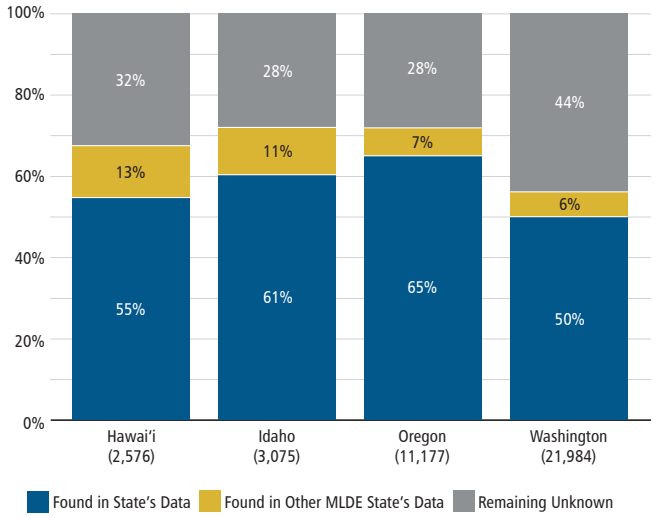
Take, for example, Washington's degree-earners. By being able to look for student outcomes outside data that only encompasses Washington, the percent of students for which we can report post-degree outcomes increases by almost 6 percent (Figure 16). And by reducing the percent unknown from 50 percent to 44 percent,

the portion for whom outcomes remain unknown actually declines by 13 percent. (That is, the gold portion of the column that is 'Found in Other MLDE States' Data' is 6 percent of all the Washington degree-earners in the chart, and 13 percent of the total unknown before the students are found in another states' data.) Similarly, 13 percent more degree-earners from Hawai'i can be reported about, and the portion for whom outcomes remain unknown actually declines by 28 percent.

On average, the additional information made possible by the four states exchanging data largely relates to confirming employment (86 percent). These types of findings hint at what more can be learned if more states were to join the exchange of data, particularly in greater coverage of work and earnings outside the state where the student earned their college degree.

Being able to get answers about where a state is getting its newly educated talent is another example of why having data that crosses state borders can be helpful to policymaking. In other words, not just seeing where your students went after graduation, but also which graduates came to your state from elsewhere to work. Table 5 presents a snapshot about student in-migration findings. It is a snapshot because it is based on the earnings analysis time frame that we use throughout,

Figure 16. Value of Exchanging Data, Additional Post-Degree Outcomes Revealed from Other Three MLDE States' Data



Note: Degrees of Associate's degree or higher by December 2010, among students with necessary data available to search for earnings.

Table 5. Recently Graduated Cohort Students Found Working In-State Who Graduated Elsewhere

	In-Migrated Working Students					
	Number From Each Cohort		Percent of In-state Degree-Earners Found Working		Percent of All In-Migrated Students Working	
	Cohort A	Cohort B	Cohort A	Cohort B	Cohort A	Cohort B
Hawai'i	149	29	16%	7%	6%	5%
Idaho	265	61	23	7	11	11
Oregon	771	224	17	8	33	41
Washington	1,176	237	13	6	50	43
Total	2,361	551			100%	100%

Notes: Among 42,176 students who completed at least an Associate's degree by December, 2010, and with necessary data available for measuring employment location 10-12 months after degree awarded. In-migrants defined as Cohort A degree-holders working in the state who were not among that states' high school graduates; or Cohort B degree-holders working in the state who did not start their postsecondary studies in that state.

which is where graduates are found within 10-12 months post-degree, and because it only refers to student movement among the original defined cohort. That is, in-migration is obviously much larger than what can be described by looking at geographic mobility among the 192,689 Class of 2005 high school graduates or AY2005-06 first-time college students. We can only definitively confirm in-migration among Cohort A students, since we know their pre-college location (2,361 in-migrating college graduates didn't graduate high school from the state they were found working). And though we can't derive quite the same result for the Cohort B first-time college students, we can additionally find Cohort B students who earned their degree somewhere other than Hawai'i, Idaho, Oregon or Washington, but were then found working in one of these MLDE states (551 degree-earners).

Earnings Outcomes

Finally, we present some results about what happened with the states' college students in terms of earnings outcomes. This is of great interest to policymaking, of course. But we intend our analysis to also enhance the existing and rapidly expanding body of research on college graduates' earnings outcomes, by providing some examples of how these outcomes vary when you have the type of coverage that this MLDE dataset provided.[28] Presumably, earnings may vary among students found in-state, those who work out-of-state, graduates of different programs, or any combination of these factors, among others. Specifically, in our earnings results we isolate students who were found concurrently working and enrolled, since continued studies presumably has a bearing on earnings. We also present earnings outside the state in which the college degree was awarded distinct from those in-state.

Beyond this, there are a number of factors that are important to interpreting the earnings of college students and graduates. These factors vary and can be said to be evolving in the existing research about post-award earnings outcomes. For example, results from CollegeMeasures.org attempt to account for part-time employment (which may or may not relate to concurrent enrollment) by reporting earnings only for students whose earnings are above a proxy for full-time earnings (at or above Federal minimum wage). We heard from the participating states about various other analytical considerations for investigating earnings and discuss these in the Appendix A: Technical Details. We hope that by showing the variability of earnings by different student groupings, we can at least add to the conversation and growing body of research about college graduates' earnings, and highlight the need to dig deeper for evidence if such data are to be used for decision making.

The categories of students/graduates that are included for the earnings analysis is virtually the same as for the foregoing Mobility analysis, in that the end-points are college students who completed at least an Associate's degree by December 2010 (or not, in the case of 'Students Who Did Not Complete a Degree by December 2010'). December 2010 was decided as the end-point to make it possible to look at earnings 12 months post-degree for all degree-earners. However, the time period for looking at earnings for those who did not complete a degree by December 2010 is different; it is earnings found in the wage quarter immediately after the student's last enrollment. Also, how we think about the 'enrolled' category of students here will vary based on which students' earnings are being presented. For degree-earners, we are concerned with whether we find an enrollment for them concurrent

with the earnings we find at about 12 months post-degree, because earnings might reasonably be lower among students who were working while continuing their studies. For students who did not complete a degree, we present earnings for those who are still enrolled after six years separate from those who are not.

Table 6 summarizes the students who were considered for earnings analysis and provides some sense of the variety of circumstances that can have bearing on the interpretation of earnings outcomes. The results in Table 6 also reiterate how exchanging data across borders increases knowledge of student outcomes – specifically the additional 10 percent of students who are found among another state's enrollment or earnings data from the state they graduated or were last enrolled ('Out-of-state').

Table 6. Categorization of Students for Earnings Analysis[29]

	Where Earnings Were Found, Relative to State of Award		Earnings Not Found
	In-state	Out-of-state	
Completed Degree by December 31, 2010	24,116		18,060
Associate's Degree	7,569		5,066
Concurrently enrolled and working	1,698	192	n/a
Not concurrently enrolled and working	5,164	515	n/a
Bachelor's Degree or higher	16,547		12,994
Concurrently enrolled and working	1,340	284	n/a
Not concurrently enrolled and working	12,930	1,993	n/a
Did not Complete Degree by December 31, 2010	51,170		39,584
Completed an Associate's Degree or Higher in 2011	3,113		3,637
Completed Certificate by end of six years	2,016		1,617
Still enrolled after six years	3,113		3,637
Stopped out completely	35,222		23,187

Notes: Among 132,930 students ever enrolled, for whom the necessary data were also available for earnings analysis; 29,961 students who had enrollment data but not data for earnings analysis are therefore not included in the results in this section.

Figures 17 through 20 depict quarterly earnings for the 57 percent of students overall for whom we could find earnings data. We refer to individuals for whom earnings data were not found, as *'not found'*, rather than *'not working,'* because we cannot say with certainty that someone is not working (at all or in a given state).[30]

Students' quarterly earnings can represent a variety of circumstances that can have bearing on earnings potential. For that reason, we present the median and 25th and 75th percentile quarterly earnings for each group of degree holders overall ('All Degree Holders'); for students who were also found enrolled in the same time as when the earnings were observed ('Concurrently Enrolled') versus those who were not ('Not Concurrently Enrolled'); and for students whose earnings were found in the state in which they received their degree ('Earnings from Award State') or from one other of the MLDE states ('Earnings from Other State').

Figure 17 shows median and 25th and 75th percentile quarterly earnings for all those who completed at least an Associate's degree by December, 2010, and for whom earnings were found in the quarter 10-12 months after the date of their award.[31] It demonstrates the generally lower quarterly earnings for graduates who were also enrolled at that time compared to those who were not. And it also shows

the variability of earnings if they are found in another state compared to those found working in the state where they received their award approximately a year earlier.

Figure 17. Quarterly Earnings Approximately 10-12 Months After Award Conferred, Students Who Completed Degree by December 2010 (Median, 25th and 75th Percentile Earnings in Actual Dollars)

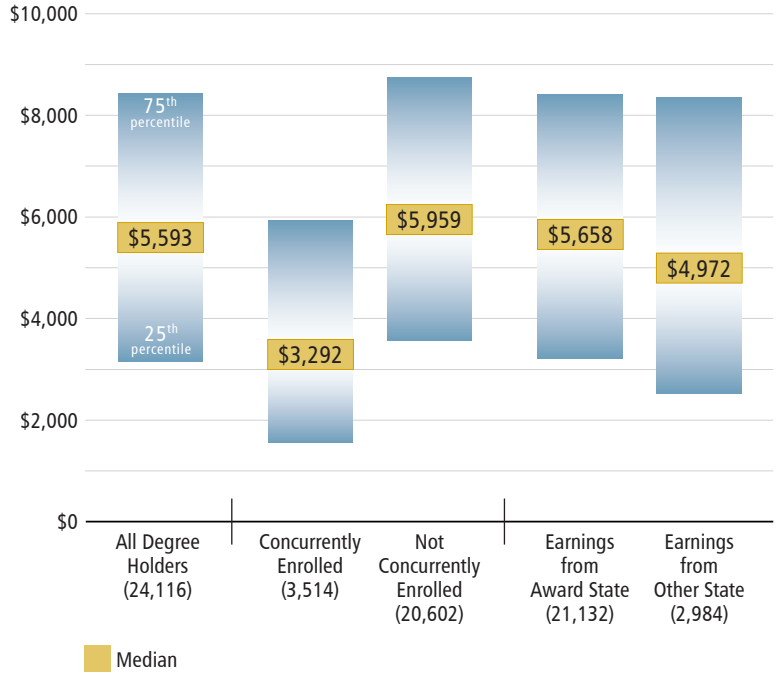
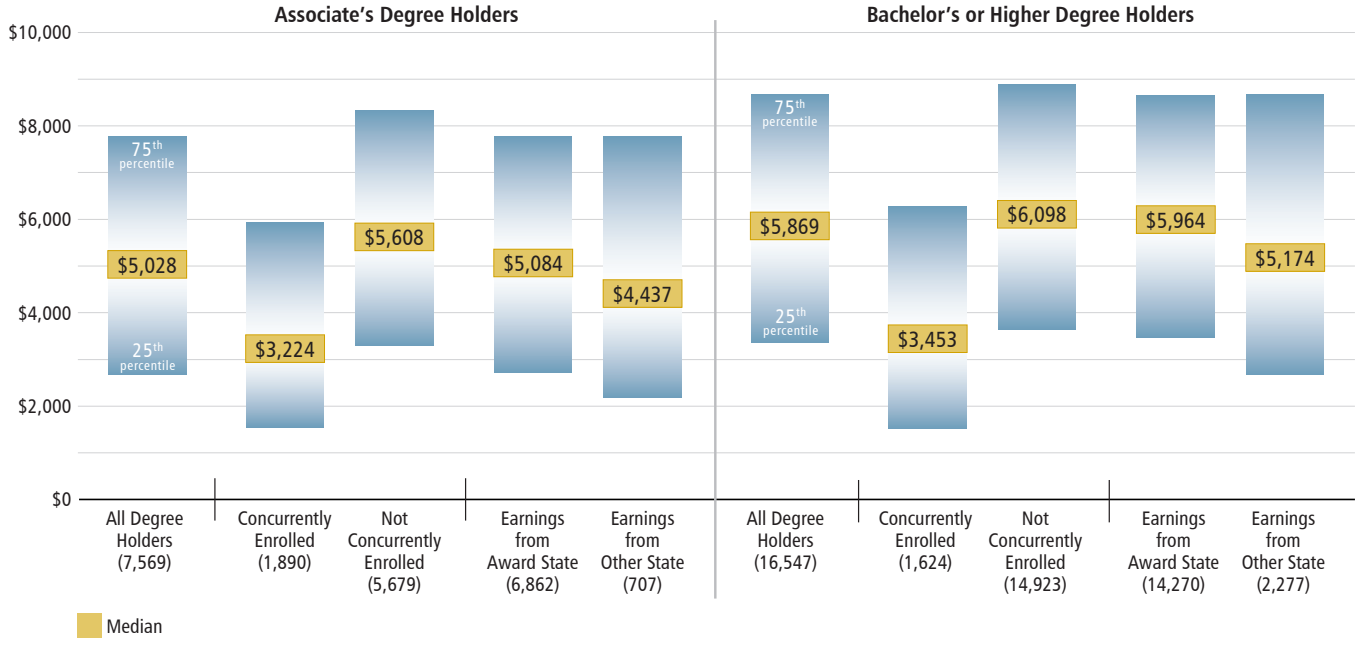


Figure 18 shows quarterly earnings results among all those who completed an Associate's degree by December, 2010, compared to those who completed a Bachelor's degree or higher by then. It reflects lower earnings among Associate's degree-earners compared to Bachelor's degrees or higher. It is also consistent with what is seen in Figure 17 – generally lower quarterly earnings for graduates who also were enrolled at that time compared to those who were not, and variability

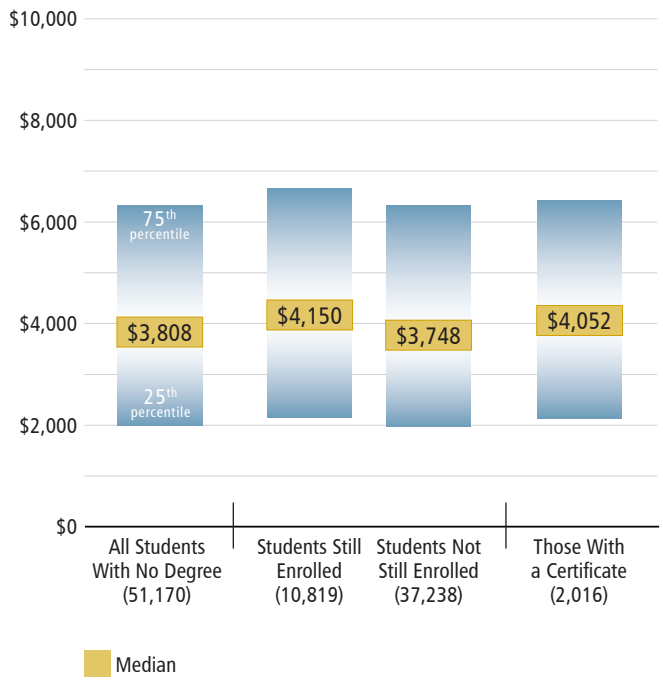
Figure 18. Quarterly Earnings Approximately 10-12 Months After Award Conferred, Students Who Completed Degree by December 2010, by Degree Level (Median, 25th and 75th Percentile Earnings in Actual Dollars)



of earnings for those found in another state compared to those found working in the state where they received their award.

These earnings results correspond with an inherent logic that lower earnings can be expected among those who are concurrently working and studying. Of course, earnings presented among all students with earnings, in aggregate, disguises some of the variability one might expect if they were presented separately by state, in which case differences in economic vitality and industry composition might be factors.

Figure 19. Quarterly Earnings in Wage Quarter After Last Enrollment, Students Who Did Not Complete a Degree by December 2010 (Median, 25th and 75th Percentile Earnings in Actual Dollars)



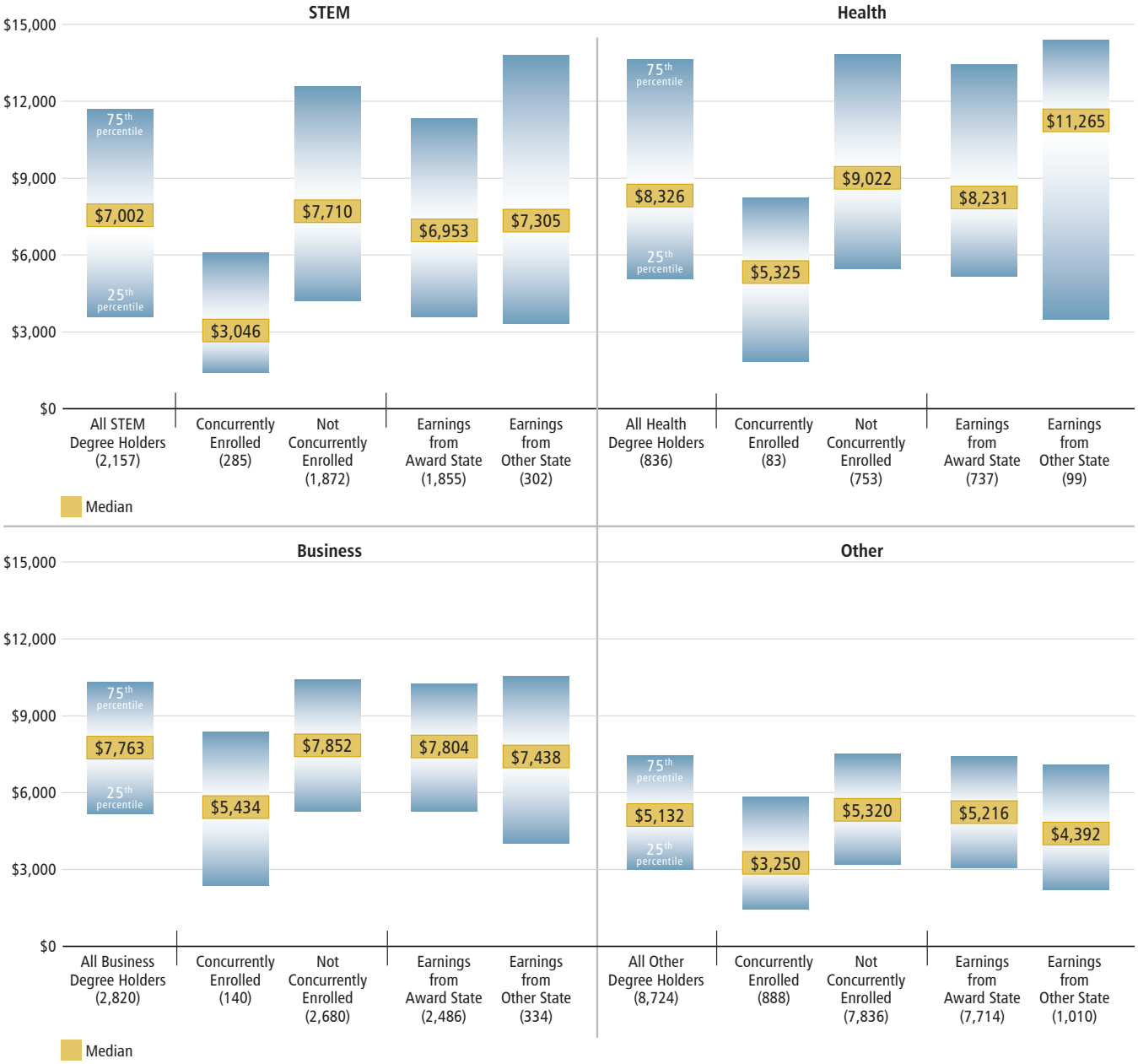
Notes: "Still Enrolled" students are those with an enrollment record in Spring 2011. Earnings are measured in the wage quarter after, and not overlapping with, the last enrollment term (Q1 of the following year for Fall term last enrollments and Q3 of the same year for Spring or Summer term last enrollments). "Certificate" encompasses certificate earners who completely stopped out after earning their certificate as well as those found to be enrolled in Spring 2011.

Figure 19 shows quarterly earnings results for the college students who did not complete at least an Associate's degree by December 2010 ('All Students With No Degree'). Students who did not complete a degree but were still enrolled after six years ('Students Still Enrolled') are compared to those who were not enrolled ('Students Not Still Enrolled'). Earnings for those who earned at least a certificate by the end of the six years, but not a degree, are also presented. These findings indicate substantially lower earnings among students who did not complete a degree compared to those who did (considering that we allowed for several fewer months to look for earnings for non-degreed students compared to degreed students). The differences in earnings are most likely a real effect of having less education in the labor market. Those who continue to be enrolled after six years show higher earnings than those who stopped out completely. This may reflect some earnings power from having 'some college,' similar to what is shown for those who earned at least a certificate.

Figure 20 (next page) shows quarterly earnings results for students who completed a Bachelor's degree or higher, broken out by several fields of study: science, technology, engineering, mathematics (STEM), health, business, and all others.[32] There is a significant amount of variation. There are relatively few STEM degree-holders, and a higher proportion of STEM degree-holders for whom earnings were found were concurrently enrolled at the same time, which may explain why their earnings show lower than those who have a Bachelor's degree in health. STEM

and business degree holders have relatively similar earnings. And students with baccalaureate degrees in STEM, health, and business all appear to earn more than those with degrees in other fields. Further analysis of these industry sectors might shed some light on these findings. For example, recently graduated STEM degree holders may not be working as intensely in scientific fields, as suggested by the higher rates of continued enrollment. Similarly, one would expect to find earnings variation among the large number of degree-holders from 'Other' programs, which could be attributed to their field of study, to the type of job they hold, or the industry sector in which they work.

Figure 20. Quarterly Earnings Approximately 10-12 Months After Award Conferred, Bachelor's or Higher Degrees Completed by December 2010, by CIP Category (Median, 25th and 75th Percentile Earnings in Actual Dollars)



Note: Students grouped at the two-digit level using Classification of Instructional Programs (CIP) codes, where 'STEM' encompasses CIP families 4, 11, 14, 15, 26, 27, 40, 41, 'Health' is 51, 'Business' is 52 and 'Other' encompasses all other CIP families or codes.

Conclusions

The findings described in this paper provide rich detail that is important to higher education policymaking and practice. In some cases, we have presented results from perspectives that are only possible from an extensive and comprehensive dataset. We had that extensive dataset: 192,689 students who comprised the public high school graduating Classes of 2005 and first-time college students in public colleges in academic year 2005-06 in Hawai'i, Idaho, Oregon, and Washington. This data permitted analysis of outcomes over a six-year period from relatively unprecedented perspectives such as whether college students were recent high school graduates and from where, degree completion relative to Pell grant status, and the underlying patterns of student educational and employment mobility across state lines.

Beyond just depicting outcomes, these findings should also illustrate the need to dig deeper into the research when making decisions or setting higher education policy. There are underlying differences related to the variety of students that argue against drawing sweeping conclusions from overall results that only touch the surface. Some of the lessons to be learned here are difficult to disentangle from the simple reason for undertaking this project in the first place – to provide evidence that more comprehensive and nuanced data will reveal more nuanced results. Having this evidence should support better decision making where a one-size-fits-all approach may not achieve what was intended. Moreover, the findings that are possible because four states exchanged data, and each state found outcomes for an additional portion of their students that they couldn't from their own data, provide a clear indication of the value of this pursuit – that exchanging rich and detailed student-level data across state boundaries, and cooperating to do so, is indeed worthwhile. The additional information we are able to provide from exchanging data among four states is only the tip of the iceberg compared to what could be found among more of the remaining states in the nation. It is worth noting that some of the challenges of interpretation revealed in this section are reduced as more states – and the private sector – participate.

Finally, these findings are really only a teaser. Being able to dig deeper with this rich dataset answered more questions than previously possible, but only suggested exponentially more. While it was outside the scope of this pilot project to perform every possible analyses that these extensive data make possible, we hope to have elucidated the variety of other investigations that might be done, ranging from 'swirl' and transfer analysis that would supplement similar recent analysis by the National Student Clearinghouse; to investigating earnings over time, wage growth and changes in employment sector;[32] and any number of further areas for research that were mentioned throughout the report. While almost too complex to describe at times, this project and our efforts to analyze the resulting fertile dataset have helped to tease out some important analytical considerations for other researchers working with similar data, or assembling differing datasets.

Endnotes

[1] Prescott, Brian T., "Beyond Borders: Understanding the Development and Mobility of Human Capital in an Age of Data-Driven Accountability - A Report on WICHE's Multistate Longitudinal Data Exchange Pilot Project," Boulder, CO: Western Interstate Commission for Higher Education, 2014, at www.wiche.edu.

[2] See Appendix A: Technical Details for more information about known exclusions to both cohorts, including the absence of Class of 2005 nonpublic high school graduates and 17 percent of Idaho's public high school graduates from Cohort A, and the absence of first-time college students at private colleges in academic year 2005-06 from Cohort B, among other exceptions.

[3] The race/ethnicity classifications we have to present results are based on the nature of student race/ethnicity data collection at the time the cohort was identified, in the time period 2004 to 2006. Therefore, the five race/ethnicity classifications we use (Native American/Alaska Native, Asian/Native Hawai'ian/Pacific Islander, Black, Hispanic and White) are not necessarily comparable to more recent race/ethnicity classifications, and may vary by state or agency data source. Also, 26 percent of Hawai'i students were reported as Native Hawai'ian/Pacific Islander, but because it was not possible to isolate Pacific Islanders overall, we report their results under the combined 'Asian/ Native Hawai'ian/Pacific Islander' category. See Appendix A: Technical Details for further details.

[4] Based on birth date provided. The age of the student relates to their age at the time the cohort was constructed, e.g., between April 2005 and August 2006. For the Cohort A Class of 2005 high school graduates, this would be at the time of graduation from high school. For Cohort B first-time college students who were not also among the states' high school graduates, it is the age at which they first entered college.

[5] There are a small number of students who we discovered had significant data anomalies but we ultimately chose not to remove them from the overall cohort. While reported in the overall counts, these students will not appear in most of the results that require specific enrollment parameters for the analysis. Also, the percentage distribution of which sector students first enrolled in would vary based on how the first enrollment sector is chosen, among the 3,142 students who enrolled in more than one institution in their first term, e.g., concurrently in a two- and four-year institution or multiple four-year institutions. See Appendix A: Technical Details for further details and definition of 'initial enrollment' for these results.

[6] See endnote 1.

[7] Students who attempted credits in at least one enrollment term, also referred to as students 'enrolled at least once'.

[8] This is a rough indicator of staying or returning to the state of high school graduation. It does not encompass 100 percent of the students who enrolled in college, because it excludes the 20 percent of students for whom necessary data were not available to search for earnings. Also, this result is relative to each student's degree award date or last enrollment, not at a single in point in time for all students.

[9] Prescott, Brian T., "Demography as Destiny: Policy Considerations in Enrollment Management," Boulder, CO: Western Interstate Commission for Higher Education, 2013, at www.wiche.edu.

[10] Among the Cohort A high school graduates, 11,263 were found to have at least one enrollment prior to their high school graduation; 66 percent were Class of 2005 high school graduates in Washington. There were also about 3,300 students among the first-time college student cohort whose data indicate they were less than 17 years old as of May 2005 but not a high school graduate of one of the four states, suggesting they were high school students who were dual-enrolled.

[11] Hossler, Don, Shapiro, Doug and Dundar, Afet, et al, "Transfer and Mobility: A National View of Pre-Degree Student Movement in Postsecondary Institutions," National Student Clearinghouse: Herndon: VA, 2012 and Shapiro, Doug and Dundar, Afet, "Baccalaureate Attainment: A National View of the Postsecondary Outcomes of Students Who Transfer from Two-Year to Four-Year Institutions," National Student Clearinghouse: Herndon, VA, 2013, available at http://nscresearchcenter.org/.

[12] We include the 5,755 awardees who received their degree from a private four-year institution in one of the MLDE states in our analyses (11.5 percent of Associate's or higher degree earners in the MLDE states), but acknowledge that states might focus only on students or degrees from their public institutions for certain topics.

[13] Generally speaking, these students can be considered "still enrolled" without a degree at the end of the six-year study, because these students first enrolled early enough to feasibly complete a degree and attended multiple terms, including the final term we tracked. However, there are a variety of enrollment patterns among these 'still enrolled' students, including continuous and intermittent enrollment.

[14] Students still pursuing a degree but who were not enrolled during the final term(s) in 2011 may be included among these categorized as 'No award-stopped out without degree'.

[15] This counts certificates earned at any point in the six years, not limited to those certificates earned before the highest degree.

[16] See Appendix A: Technical Details about how we constructed analysis of Pell receipt.

[17] These findings are consistent with results from the Beginning Postsecondary Student 04/09 cohort, which indicate that 23 percent of those who received Pell completed a Bachelor's or higher in six years compared to 37 percent of students who didn't receive Pell. Source: U.S. Department of Education, National Center for Education Statistics, 2003-04 Beginning Postsecondary Students Longitudinal Study, Second Follow-up (BPS:04/09), author's calculations from PowerStats on 4 April 2014. Also, it is worth nothing that graduation rates for Pell recipients were an item recommended for the Integrated Postsecondary Education Data System IPEDS (see IPEDS TRP summary "TRP #24 - Collecting GRS data on part-time students and Pell grant recipients" at https://edsurveys.rti.org/ipeds_trp/documents/TRP_24_Summary_final.pdf); these MLDE will permit that type of investigation. See also "Demographic and Academic Characteristics of Pell Grant Recipients at Community Colleges", Sung-Woo Cho, James Jacobs, and Christine Zhang, November 2013, CCRC Working Paper No. 65. http://ccrc.tc.columbia.edu/.

[18] Among a subset of approximately 13,000 students who received Pell and we could derive the frequency that they received it during the Fall and Spring semesters they were enrolled.

[19] For this analysis, 'underrepresented minority' includes students whose race/ethnicity is American Indian/ Alaska Native, Black or Hispanic. We are aware that Pacific Islander students might typically fall closer to other

underrepresented minorities in their educational experiences, and they are heavily represented in our data by virtue of Hawai'i participating in the MLDE. They appear to be outnumbered by other students in this category who, as a group, demonstrate outcomes closer to White students.

[20] Additionally, there were about 1,200 students who appeared 'intensely' non-traditional, that is, who were racial/ethnic minorities, started at age 20 or after and who received a Pell award at least once. Students who met all three of these criteria appeared substantially less likely to have completed a degree in six years, particularly a Bachelor's or higher degree, and more likely to still be enrolled after six years.

[21] 3,276 of these Cohort B students were less than 17 years old in May 2005, an indication that they may have been dual-enrolled high school students. We retained these students in Cohort B and include them in the results; our analysis indicated that their inclusion does not materially affect the results.

[22] Our analysis of college graduates is at 'about one year' after they received their award. It is approximately 10 to 12 months later, and is not precisely one year. It is not possible to make an exact comparison between degree dates and the earnings data. The analysis is based on an individual-level comparison of the student's specific chronological date of award, to quarterly wage data, which cover a three-month quarter. See Appendix A: Technical Details for more information.

[23] Earnings data from the four participating states covered approximately eight years, October, 2004, through May, 2012; from the year prior to when the cohort started (except for Hawai'i) and almost a year and one-half past the postsecondary data. This was combined with virtually national coverage of postsecondary activity for this cohort of students between April, 2005, to August, 2011, by virtue of the four-state data exchange and the data provided through the National Student Clearinghouse.

[24] Specifically, for students whose last enrollment was in a spring or summer term, we look for a wage report in Quarter 3 of the same year; for those who last enrollment was in a fall term, we look for a wage report in Quarter 1 of the next year.

[25] We did not receive necessary data to search for earnings for 7,544 of the Cohort A direct college-going degree-earners, who are therefore excluded from the mobility and earnings analyses.

[26] This can encompass any number of circumstances, ranging from those who continuously enrolled to those stopped out at some point but enrolled again in the last term of the study.

[27] The gold column portion covers results known because of enrollment and award data exchanged by the four states for public postsecondary institutions and earnings data, plus the additional results that become known from the data provided through the National Student Clearinghouse.

[28] For examples of related research, see Schneider, Mark, "Higher Education Pays: But a Lot More for Some Graduates Than for Others", American Institutes for Research: Washington, DC accessed 7 May 2014 at http://collegemeasures.org/. Also, Zhang, Ting and Stevens, David, "Integrated Data System Person Identification: Accuracy Requirements and Methods", The Jacob France Institute, University of Baltimore: Baltimore, MD, 2012, accessed 7 May 2014 at http://www.jacob-france-institute.org/publications.php.

[29] Although the Mobility and Earnings results are based on largely similar analysis, the number of students may not be exactly equal between both sections due to analysis criteria that are not exactly equal. For example, here we found earnings data for 16,547 recipients of Bachelor's degrees or higher, 14,270 of whom were found in the state of award and not concurrently enrolled. But in the Mobility section, that number (55 percent of all Bachelor's degree earners) calculates to 14,414 students.

[30] For the 43 percent of students in Table 6 for whom we had the necessary data to search for earnings but did not identify any (referred to as 'wages not found'), there are a variety of circumstances that might explain why we didn't find earnings, including but not limited to: the student moved to somewhere other than Hawai'i, Idaho, Oregon, or Washington; the student was in fact employed in one of the four states but not in work that is covered under unemployment insurance earnings reports; the student was not employed in the timeframe we searched, but may have been before or after that time period.

[31] Our results for 10 to 12 months post-degree or in the earnings quarter after a non-degreed student's last observed enrollment represents only one snapshot in time. Further research would be needed to determine whether earnings change further out in time, as one might expect from accrual of higher education wage premiums or increasing work experience. Furthermore, while this initial analysis looks only at a single quarters total earnings, different patterns might be observed using hourly, weekly, monthly or annual earnings.

[32] We collapsed Classification of Instructional Programs (CIP) codes/academic programs into broad categories in order to have sufficient numbers of students to analyze.

[33] Ibid, Zhang and Stevens.

Appendix A: Technical Details

This report describes college attendance, completion and employment patterns for a combined cohort of Class of 2005 public high school graduates and first-time undergraduate students at public institutions in Hawai'i, Idaho, Oregon and Washington states during the 2005-06 academic year that resulted from WICHE's Multistate Longitudinal Data Exchange (MLDE) project. The study follows this cohort of students through college enrollment and completion virtually anywhere in the U.S. for six years through August 2011, and through employment in any of the four states for seven years through December 2012. The college completion results presented in this report center on six-year degree outcomes, of associate's and through baccalaureate completion (i.e., receipt of a bachelor's degree or higher by the end of the six-year study period). The employment results focus on whether and where college graduates were found working about a year after graduation or soon after their last enrollment for students who did not complete a degree. This report also presents student mobility patterns, including students' location as indicated by postsecondary enrollment or employment earnings compared to their state of high school graduation (if known) or postsecondary starting location, at various points in their education trajectory.

This appendix describes the methods by which the data received from the participating states was reconciled to student-level records and compiled into a single de-identified dataset and then prepared for analysis, including important data topics and data limitations discovered during that process, and analytical parameters for the results presented in the report. And, suggests areas for further research that were not covered in the report. Tables 2 to 5 at the end of the appendix list the data items available to WICHE from the exchanged data, and key observations about them that influenced our approach to the analysis.

It is important to note that the appendix describes what could be discerned from the de-identified dataset, with a focus on the four-state combined data. This frame of reference may mean that observations, results and student counts may vary from what could be reported using the data with student identifiers or from a single state's perspective, or using different business rules. For example, one might be able to conclusively determine using personal identifiers, which cohort the 58 high school graduates and 112 first-time college students should be assigned to, who were found in more than one state's cohort. As another example, the results might differ slightly depending on what business rules are used with the 10 percent of students who co-enrolled at some point in more than one institution. However, most of these and other potential differences would be relatively minor in number, and unlikely to materially affect the overall results according to our analysis.

Cohort Identification and Data

The primary report, *Beyond Borders: Understanding the Development and Mobility of Human Capital in an Age of Data-Driven Accountability*, describes the data fields and definitions that the agencies in the participating states include in the study cohort, and how the data were compiled into the consolidated dataset. This section highlights important facets of the underlying cohort definition, some of the data elements, and observations about the resulting sets of students included in the cohort that may have bearing on the results presented or on future iterations of data exchange.

Cohort A: Class of 2005 Public High School Graduates

The inclusion criteria for Cohort A high school graduates was that the student graduated from a public high school in the state during the 2004-05 academic year, including trailing summer 2005. 'High school graduate' was defined as consistent with the definition the state uses for its submission to the Common Core of Data (generally only those with regular diplomas or GEDs). Students who were known to be dually enrolled in postsecondary institutions were to be included in the cohort extraction if they received a high school graduation award during the 2004-05 academic year.

Several exclusions to the students captured in Cohort A are worth noting:

- High school graduates from non-public schools were not specifically drawn into the cohort. Table A1 presents the Class of 2005 non-public high school graduate counts that were reported to NCES, by state, and the percent that non-public graduates were of all high school graduates in academic year 2004-05.[1] There were potentially 10,581 non-public high school graduates in AY2004-05, or approximately 10 percent more high school graduates than were extracted into Cohort A.

Table A1. Class of 2005 Non-public High School Graduates (Estimated), by State

	Number of Graduates	Percent of Total
Hawai'i	2,583	19%
Idaho	555	3
Oregon	2,848	8
Washington	4,595	7
Total	**10,581**	

Source: National Center for Education Statistics Private School Survey.

- There were also some public high school graduates missing from Idaho's cohort. Idaho obtained high school graduate data directly from the school districts, and 17 percent of the 12th grade public school population in Fall 2004 were in districts known not to have reported.[2] Thus, we estimate that as many as 2,200 Idaho public high school graduates were not included in Idaho's Cohort A. (Also, about a quarter of Idaho's high school graduate records did not include race/ethnicity data for us to analyze.)

It should be noted that some of the high school graduates who were not specifically included in the states' Cohort A would be captured in the postsecondary component of the cohort if they enrolled in college in one of the four states' public institutions in academic year 2005-06.

Cohort B: First-time Postsecondary Students

Cohort B criteria were that the student was identified as a first-time undergraduate enrollee during the 2005-06 academic year (including leading summer 2005) in either credit-bearing or remedial/developmental courses, whether they were degree-seeking or not. If the student was known to be a dual-enrolled high school student, they were to be excluded (see discussion about this below). Defining and extracting students for Cohort B proved to be less straightforward than for Cohort A. Considerable analysis and data cleaning was required to make the dataset ready

for analysis, especially to exclude students who did not fit the cohort definition based on the data provided.

The first adjustment was for known exclusions, either those that arose from the cohort definition or were discovered as we began to work with the data:

- By definition, first-time college students at private nonprofit and for-profit colleges in academic year 2005-06 were not part of the cohort.
- Hawai'i's first-time college freshmen cohort is missing an estimated 1,200 students, because Hawai'i inadvertently did not extract Spring 2006 first-time college students into their Cohort B.[3]

There may in fact be other types of students who attended college for the first time in academic year 2005-06 which we are not aware of. For example, other reports have hinted at other limitations with this type of longitudinal analysis, including students/data missed because of apprenticeship, among other possibilities.[4]

Having the extent of data that we did, we were also able to determine that some Cohort B students were included who didn't meet our intended definition of first-time college student. We ultimately refined the pool of students in Cohort B and excluded those who were not part of our intended cohort for the findings we present in this report. But, some information about them could be instructive to others:

- The largest refinement was removing about 29,000 students that the states/public institutions understood to be first-time college students but who were found to have previous postsecondary activity (not including dual-enrolled high school students). See the detailed discussion below.
- Along the same lines, a small percent of students who were in Cohort B because they were considered first-time at a public institution in one of the states, were also found enrolled at a private institution or at an institution outside of the state (667 students, 1 percent).
- Also, a small percent of students identified as first-time college students for Cohort B were not found among the term enrollment data (1,013 students) and were removed from Cohort B. This combined with the fact that we found some term enrollment records provided by the states that were actually terms where the student withdrew, suggest that there will always be a portion of students considered college students who could be retroactively defined as not being college students.

Ultimately, we took a conservative approach to changing the underlying set of students in the cohort as we discovered things that could justify their removal, and we retained the largest number of students for whom we could report basic patterns of enrollment, degree completion, and mobility patterns. And, we modified on a case-by-case basis the subset of students included in any given analysis.

Removing College Students with Prior College Activity

By comparing data across states and against the supplemental data available to the National Student Clearinghouse, we found an unexpectedly high rate of students in Cohort B who were thought to be first-time college students but who actually had prior college activity, and needed to be retroactively excluded from Cohort B. Of course, we intended to include in our study high school graduates who had been

dually/concurrently enrolled during high school. They are in Cohort A if they were from any of the MLDE states' public high schools. But, dually enrolled high school students/graduates from other states or private high schools show up in Cohort B instead and can only be isolated based on age. Therefore, we were careful in our retroactive refinement of Cohort B, to retain students whose prior enrollment occurred before they were 19 years old and indicated high school dual/concurrent enrollment.

We ultimately excluded from our analysis about 29,000 students who were in the initial Cohort B (before data cleaning) with postsecondary enrollment activity in the four years before May 1, 2005, or a degree before May 1, 2005, who were 19 years or older at the time of the observed enrollment or award. That amounted to about 20 percent of the students who were initially thought to be first-time college students.[5]

- 26 percent of the 'prior college students' had previously earned a degree; 51 percent of which had a Bachelor's or higher degree and 25 percent had an Associate's degree, and 73 percent of the degrees were awarded two or more years before the cohort start date.
- 53 percent of the prior college students had three or more prior enrollment terms.
- For 67 percent of the prior college students, the latest enrollment was within the year before the study began. And, among the prior college students who had only one prior enrollment term, half were within the year prior to the study's start. In other words, the majority of these prior college students who were misidentified as first-time college students for Cohort B were active in postsecondary activity immediately prior to the study, and not students who had stopped out long ago.[6]

On the other hand, due to the complications of retroactively distinguishing dual enrolled high school students from those we removed, there remain 3,276 students in Cohort B who are likely to have been dually enrolled high school students but not yet high school graduates, because they were less than 17 years old as of May 2005, when the cohort was extracted. Our analysis indicates that retaining them in the analysis does not materially affect the results overall or when we look at those students who were only in Cohort B.

Data Coverage, Data Filters and Definitions for Postsecondary Participation and Degree Completion

This section discusses the data we had available for postsecondary term enrollments and awards, preparation of that data for analysis, and limitations or implications for the analysis. Tables 2 to 5 list the data items that were provided by the participating states and the NSC, and key observations about them that relate to the analysis.

Term Enrollment and Awards Data Coverage

The results presented in this report are based on the public postsecondary institution enrollments and award data exchanged by the states, supplemented with similar data that the NSC provided for students in the cohort who attended private (non-profit) postsecondary institutions or an institution in any of the other 46 states (and D.C.). The enrollments and awards data covered six years, from

April 2005 to August 2011, making it possible to describe college participation and completion over a six-year period. For results where we report student characteristics such as age, sex and race/ethnicity, the results are derived from the combination of data from both K-12 and postsecondary sources.

Appendix B outlines the NSC's data coverage and some of the key steps it took to conglomerate the postsecondary enrollment and awards data it received from the states, reduce duplication, synthesize data from the multiple sources, merge the postsecondary and earnings data with the cohort student records to assign unique, anonymized identifiers for linking, and provide WICHE with a dataset in which all personal identifying information had been removed. The NSC adhered to stringent data security and privacy requirements as agreed to by the states and specified in the Memorandum of Understanding. Tables 2 to 5 list the data elements that were available to WICHE in this dataset to construct the analysis that we detail in the following sections, and key observations about those source data that played a role in how we approached certain analyses. States agreed to use the Common Education Data Standards (CEDS) as a consistent jumping off point for data definitions and categories, but it was not always possible for states to adhere to these and in some cases it was necessary to transform source data to perform analysis.

De-duplicating Multiple Sources of Data

Because WICHE received postsecondary term enrollment and awards data that were provided by the four participating states, and from NSC, having data from more than one source made it possible to determine by how much given states can gain additional information about their student populations from other states or other data sources. However, the multiple data sources created significant duplication/overlap, which further revealed a significant amount of inconsistency. WICHE therefore had to de-duplicate in order to have a single valid enrollment record per student-term-institution, and this process was complicated by the fact that states' data and the NSC's contained many but not all of the same data elements and values. WICHE elected to abide by the principle that state-supplied data generally took priority over the NSC data, both because the pilot was first and foremost a data exchange among states who ultimately and collectively "own" the project and, secondly, the pilot was based on a principle of data governance articulated by the participating states that data accuracy is best as "close" to the source as possible. The steps taken to account for inconstancy in enrollment records were:

- We assigned enrollment and awards records to standard academic Fall, Spring and Summer terms using term beginning and end dates for the purpose of data preparation and de-duplication (all analyses presented in this report used specific enrollment or award dates). 'Fall'=term beginning date between September 1 and December 31; 'Spring'=term beginning date between January 1 and April 30; 'Summer'=term beginning date between May 1 and August 31.[7] Similar rules were applied to categorize college degree award dates.
- We standardized instructional activity hours[8] and excluded enrollment records showing no attempted credits or otherwise not appearing to be an active enrollment, including: approximately 30,000 enrollment records

supplied by the NSC that indicated the student withdrew, was on leave of absence or was deceased in that term (however, we retained the 27 percent of state-supplied records that duplicated the NSC records removed for that term, because they had credits reported); and any other enrollment records that did not report credits attempted.

- We removed the enrollment and award records provided by the NSC for which there was a record provided by a state for the same term and institution.

Key Definitions for Enrollment and Degree Completion Analysis

The findings about enrollment patterns in this report are limited primarily to whether the student was ever enrolled in six years, when high school students were first found enrolled after high school graduation and in what state they first enrolled. We also present a few indications of whether college graduates are found enrolled after their degree or when found working (concurrent enrollment), or whether students who didn't earn a college degree were still enrolled after six years. This section describes how we used the cleaned/prepared term enrollments data to determine the results described in this report, several aspects of how the abundance and complexity of these type of data impact research, or how data issues impacted our approach to the analysis. Readers should refer to Tables 2 to 5 for more detailed information about the data elements described below.

Initial enrollment. We used the chronological first institutional term enrollment as the one to report about the student's first/initial postsecondary enrollment. We selected the term with the highest attempted credits for any student who was enrolled at more than one institution in the first term or the term we report about for post-degree concurrent enrollment or the last term for non-completers. These criteria were sufficient for our primary enrollment pattern findings, which describe in which state students first started their postsecondary studies, and in the case of Cohort A high school graduates, how long after high school graduation.

Enrollment sector, state, and level. We used the enrollment institution's control (public or private), level (2-year, 4-year or other) and state to describe students' enrollment patterns.[9]

Highest degree completed. We report about the students' highest observed degree at two different points in time: by or before August 31, 2011 for overall degree completion results and by or before December 31, 2010 for mobility and earnings analysis. We defined degree-earners as 'Associate's or higher', where 'Associate's degrees' encompasses only Associate's degrees and 'Bachelor's degree or higher' includes Bachelor's, Master's, Doctor's and post-baccalaureate and post-master's certificates. Our approach to categorizing students who did not complete at least an Associate's degree by the end of the study require more detailed explanation:

- *Started too late to complete a degree*. 5,045 students started their postsecondary studies too late to complete at least an Associate's degree, typically those who enrolled leaving less than two years prior to August 2011, but also including some students whose enrollment patterns showed they were pursuing a four-year degree. These students are excluded from many of the findings where we describe 'non-completers'.
- *Highest award was a certificate*. For our analyses of degree completion, we do not count students whose highest award was a sub-baccalaureate

certificate as a degree-completer. We considered this an appropriate definition, even though we acknowledge the value of sub-baccalaureate certificates, because one specific purpose of this pilot was to address mobility across state lines which we hypothesized would be more prevalent among degree-earners. But, we were also limited in whether or how we could include certificate holders among degree earners due to the lack of conformity around certificates in the data supplied by the states and the NSC, or in being able to define 'certificates of value'. In several analyses where we look at outcomes among those who did not complete at least an Associate's degree, that is when reporting about 'non-completers', we do present findings for the students for whom a certificate was their highest award.

- *Still enrolled after six years*. This applies to students who did not complete any award or degree, but who were found enrolled in Spring or Summer 2011. This definition does include a number of students who may have stopped out of postsecondary education at some point(s) during the time period covered by our data, but who happened to have returned at the end of the six years covered. 'Still enrolled' here, among non-completers, is distinct from the category used for mobility and earnings analysis, which relates to students who were enrolled concurrently with employment (see below under "Key Definitions for Earnings and Employment Analysis"). Due to the possibility of confusion, we refer to the latter type of enrollment as 'concurrently enrolled'.
- *Stopped out completely without a degree*. Students not covered by one of those categories above. We consider these students fully "non-completers" because they stopped out entirely before earning any award or degree and were not observed enrolled in Spring or Summer 2011.

Location found. This is the terminology and rationale for how we describe in which state various subsets of students are found enrolled, having earned a degree or employed:

- *'Home State' for high school graduates (Cohort A Students)*: Students who enrolled or were awarded a degree at an institution in the same state they graduated high school (only known for Cohort A students) were categorized as being found in 'home state' when we describe where students were found enrolled, having received an award or employed.
- *Where college degree earners were found in the year after award, or non-degreed students were found relative to their last enrollment*. Students observed enrolled or working in the same state as the state of the institution that conferred their degree were considered 'In-state' or 'Same state'; otherwise, 'Elsewhere'.
- *'Other Exchange State'*: Includes students who were found in a state other than the point of reference, but which was one of the four MLDE states, for example, a graduate of Hawai'i found in Idaho, Oregon or Washington. We did not typically report exactly which of the states the students were found, for brevity or due to small numbers of students; rather, we included them among 'Elsewhere'.
- *'Elsewhere'*. Students who were found enrolled, with a degree or employed somewhere other than the point of reference, e.g., high school graduates'

home state or state award conferred, which can include being found in another MLDE state for certain analyses, or in any state other than the four MLDE states.

Pell receipt. We constructed our analysis about students' receipt of Pell grants relative to data gaps in this item. Pell data were not available on records from NSC and we had only limited Pell receipt data on students attending Washington's two-year institutions. Thus, we excluded the 14 percent of students for whom we only had enrollment data from the NSC from our Pell analysis, and the 37 percent of students who were affected by gaps arising from the data for Washington's two-year institutions. This is the Pell analysis we conducted among the remaining students:

- *Overall Pell receipt*. Any student indicated to have received Pell in at least one enrollment term was categorized as 'Pell at least once'; those never observed to have received Pell were categorized 'Pell never'.
- *Pell receipt in first term*. Students who received Pell in their first observed term of study were categorized as 'Pell in first term', otherwise 'Not'.

We did not limit the cohort or analysis to those known to be degree-seeking. Our cohort B definition intentionally captured all first-time students, including both those who were degree/certificate-seeking and those who were not. In order to better ascertain students' aspirations in our analyses, we attempted to focus on those who were degree/certificate-seeking, but ultimately gaps in our data led us to retain all students in our analysis and findings. Specifically, we requested a degree-seeking flag on the states' public institution term enrollment records, and data about instructional activity hours attempted and completed in the term and earned at the start of the term. These data were not provided on most of Washington's enrollment records nor on data from the NSC, so that ultimately we had neither a degree-seeking flag nor sufficient data to derive it for 14 percent of the college students (22,870 students). Furthermore, our analysis among students for whom the degree-seeking flag was supplied introduced further uncertainty about the use of this item for filtering our results. Specifically, almost 10 percent of those who completed a degree did so without ever being shown as degree-seeking among the enrollments data (3,214 Associate's degree earners and 2,201 Bachelor's degree earners) and conversely 10 percent of those who earned an Associate's or Bachelor's actually were indicated as not degree-seeking in all their enrollment terms.

Data Coverage, Data Filters and Definitions for Earnings and Employment

This section discusses the data we had available for analyzing employment and earnings, preparation of that data for analysis, and limitations or implications for the findings and analysis. Tables 2 to 5 list the data items that were provided by the participating states, and key observations about them that relate to the analysis.

Our analysis is based on which students are present in the state unemployment insurance ('UI') earnings reports from any of the four Exchange states. The participating state education agencies provided the NSC with Social Security numbers (SSNs) for the students in the cohort. After validating the SSNs, they were submitted to the states' unemployment insurance divisions, who searched for any year-quarter earnings reports between 2004 Quarter 1 and 2012 Quarter 2,

e.g., January 1, 2004 to May 31, 2012.[10] When students for whom a valid SSN was available were matched in any of the four states' UI data, WICHE received a record per wage quarter with wages and several other data fields.[11]

Not Possible To Analyze Employment/Earnings For All Students

A valid Social Security number (SSN) was needed in order to look for earnings data but was not available for all students. Overall, there were 52,541 students in the combined cohort (27 percent) for whom a valid SSN was not available and therefore we excluded them from the earnings and mobility results we present in this report; that is, they are removed from the denominator in these results. The biggest gap is with the high school students who did not enroll in college in the six years we tracked them, among whom we only had a valid SSN for 24 percent of the students. That is, we expected SSNs to come primarily from the postsecondary data since most school districts did not provide an SSN as part of their high school graduates data. Therefore, if the high school graduates in our cohort did not enroll in college, we would largely not have a valid SSN for them to search for earnings. Given limits on accessing and using SSNs, we were also unable to capture an SSN for students in the high school graduates cohort whose only college enrollments occurred at public institutions outside of the four pilot states or at any private institution.[12]

We also could not include 4 percent of the students overall in employment/earnings matching or analysis, because our attempts at constructing matches by SSN and other personal identifying information indicated that the SSN supplied for them matched someone with distinctly different personal identifying information, or more than one SSN was supplied for the student in the data exchanged. There are also about 14 percent of students who were enrolled at some point, for which we nonetheless did not obtain a valid SSN. The highest incidence of this occurred in Hawai'i's high school graduating cohort, but also in Idaho's, and among the high school graduates who enrolled in college more than a year after graduating high school.

Ultimately, we were able to include 73 percent of all the 192,698 students in the analyses of mobility and earnings that relied on the presence of a valid SSN – and even with the gaps in SSN coverage, we could ultimately report employment results for more students than any given state could using only the data they had available in that state.

Key Definitions for Earnings and Employment Analysis

This section describes how we used the cleaned/prepared quarterly UI earnings records and, in some cases, postsecondary term enrollments and award data, to conduct analysis on these students as well as several aspects of how the nuances of these data formed our approach to the research. Readers should refer to Tables 2 to 5 for details of the data elements described below.

Quarterly earnings. We summed the earnings to obtain a total of quarterly earnings by state, i.e., if there was more than one earnings record per individual in a given state in a quarter, which indicates employment at more than one establishment in that quarter, we summed the data for an overall total of earnings per individual, by state. If more than one of the four states provided an earnings record for the individual in the quarter, we used the states' record with the greatest earnings for our analysis.

Highest degree completed by December 2010. We report about the students' highest observed degree by or before December 31, 2010 for mobility and earnings analysis, and considered those who earned at least an Associate's degree (or higher) as a degree-earner. (See the discussion above under Enrollments for more information about 'Highest Degree Earned' definitions). We set the degree conferral cut-off at December 31, 2010 to permit us to look at employment and earnings at about one year past the award conferral date for all students. We focused our mobility and employment analysis on one year out from degree conferral to be consistent with other studies of graduates' employment outcomes and to observe graduates far enough out from graduation that they might be engaged in long-term 'career' employment rather than what one might find immediately after graduation.

Our definitions for earnings and mobility analysis differ for degree-earners and those who didn't complete a degree.

College degree-earners: Employment 'about one year' (10-12 months) post-degree. We did an individual-level analysis to choose the UI record that most closely represented degree-holders' employment location and quarterly earnings at about one year after their award was conferred. However, one cannot make an exact comparison between postsecondary term and quarterly earnings data. The date of award is a specific chronological date (and in many cases corresponds to the end of an academic term). On the other hand, the earnings data cover a three-month quarter, from which we cannot separate the earnings accrued in the first, second or third month of the quarter. Therefore, we looked for earnings in the wage quarter which corresponded with 10, 11 or 12 months after the date of award, using each individual's specific award date compared to the end date of any given wage quarter. For example, we'd look for earnings in Quarter 2 of the year following award conferral for students whose degree was conferred in May and in Quarter 4 of the following year for most students whose degree was conferred in December. However, the wage quarter represents employment closer to 10 or 11 months from the award conferral date for 33 percent of individuals whose award data didn't correspond with wage quarter end dates.

College degree-earners: Post-degree enrollment. We hypothesized that students who continued to study after receiving their degree might have different employment behavior than college graduates who weren't also enrolled. That is, students might continue to study after they attained an Associate's or Bachelor's in pursuit of a higher degree and might have different work pursuits as a result, e.g., presumably lower earnings in reflection of fewer work hours or a non-professional job, or both. Since we did not have the information necessary on much of the earnings data (hours worked), we categorized students by whether they were found enrolled in the same 10-12 months post-degree period as when we looked for earnings data. Thus, if both an enrollment and earnings data were found, the student is considered 'concurrently enrolled and working'.[13]

Students who didn't complete a degree: Earnings and employment location in the wage quarter after the last enrollment term. We faced a lack of precision in selecting the non-degreed students' earnings records when comparing term enrollment and quarterly earnings data similar to that for degree-earners, due to the lack of correspondence between specific term enrollment dates and wage quarters. Further, we hypothesized that there might be different employment considerations for students who didn't complete at least an Associate's degree than for college

graduates. For example, the job immediately after the student stopped their studies might be more representative of their ongoing or foregoing employment than for college-degree earners; and non-degreed students might be more likely to move as part of their stopping out of college. Therefore, we selected the earnings for the wage quarter immediately after but not overlapping the non-degreed student's last observed enrollment. Specifically, for students whose last enrollment was in a spring or summer term, we looked for earnings in Quarter 3 of the same year; for those who last enrollment was in a fall term, we looked for earnings in Quarter 1 of the next year. The selected quarterly earnings record was then used to represent where the graduate was found working and their level of earnings.

Students who didn't complete a degree: Still enrolled at the end of the study. We hypothesized that students who didn't complete a degree but were still enrolled at the end of the six years might have different employment behavior than those who completely stopped out without a degree. Therefore, we categorized non-degreed students who were found enrolled in Spring or Summer 2011 as 'still enrolled' at the end of the study.

Students who didn't complete a degree: Highest award was a certificate. See definition above under Enrollment section, 'Highest degree completed'.

Degree field of study. Where we present earnings for those who earned a Bachelor's degree or higher, we group degrees at the two-digit CIP level as STEM (04, 11, 14, 15, 26, 27, 40, 41), Health (51), Business (52) and Other (all other), based on CIP codes for STEM and health professionals as identified by NCHEMS for National Governors Association metrics.

Other Considerations for Earnings and Employment Analysis

As discussed throughout the report, we hope to add to the existing research about college students' employment outcomes, as much in terms of the analytical nuances and use of the data available as for describing mobility and earnings outcomes. There are many possible areas for further research from this type of comprehensive, longitudinal data, as well as lessons that came from constructing this type of dataset in the MLDE pilot project. Several analytical topics are worth summarizing here:

Interpreting 'not found' in mobility and earnings results. Even though we exclude the students who didn't have valid SSNs available to match against wage records from our mobility and earnings analysis, in our findings we specifically refer to individuals for whom earnings data were not found as 'not found' rather than 'not working', because we cannot say with certainty that someone is not working (at all or in a given state). The greatest exception to being able to say that a student not found was not working is that we only have data for four states, and therefore someone not found among the four states' wage records might have been working in another state. Also, UI data do not cover most contract workers, some employers (e.g., farm, seasonal, etc.), and federal government and military, among others.[14] And, some of students not found might be a result of imperfections with identity resolution and matching by SSNs.

Interpreting findings from quarterly UI earnings data. Our analysis of the data underlying our earnings results suggest that we can have a reasonable level of confidence that the median earnings and mobility results are descriptive of students' outcomes.[15] That is, we specifically constructed our analysis to investigate

earnings by various subsets of students (e.g., those who earned an Associate's or Bachelor's or higher degree, compared to those who didn't), and at points in time that were relevant to the given groups, and hypothesized differences in behavior or outcomes. Furthermore, we present the median quarterly earnings with the 25th and 75th percentiles, to acknowledge the range of quarterly earnings we observed in the data (low and high earnings) and to give context to the median.

However, we acknowledge that there are a variety of earnings analyses that might be equally helpful to understanding college students' employment outcomes, for example: hourly wage rates or monthly earnings rather than the sum of three months' earnings; earnings at two-, three- or five years post-degree; or earnings relative to whether students worked during college. Some of these analyses were simply outside the intended scope of this pilot project, whereas for others we would need data that we did not have and often do not exist in the data available for earnings analysis. For example, to refine the analysis relative to full-time earnings, we would need some indication of employment intensity, e.g., part-time or full-time or ideally hours worked in the quarter. However, most states do not require establishments to report hours with earnings, in this case, Hawai'i and Idaho; and, there was a fair amount of unusual hours reports among the hours data reported on Oregon and Washington's earnings data.

We also might have wanted to exclude certain low or high earnings records from the medians. Officials from the states' UI agencies described certain parameters that they use in preparing the UI data or examples of what outliers might indicate. For example, extremely high quarterly earnings may be lump pension or severance distributions, which of course do not explicitly represent earnings but probably do indicate relative pay levels; or extremely low wages might represent a hiring incident that did not result in continued employment, e.g., paid training only or automated payroll activities, but may indicate attempts at employment. In the end, the cut-off criteria or reasons for outliers could vary by state and in most cases we simply didn't have the data necessary to discriminate among the outliers.[16]

Finally, observed differences in median earnings could be attributed to many things, including: differences in state economic and labor market environments; variation in the number of hours worked in the quarter or on average, which may logically vary for certain occupations (e.g., retail positions but also professional/technical occupations such as nurses and others); and many other factors that may relate as much to the individual's employment qualifications and history as to their recent educational experiences.

Data Elements

This section is not intended as a full data dictionary, per se, but to advise readers about things that directly affected the analyses presented in this report. For the data elements in the following tables, states agreed to use the Common Education Data Standards (CEDS) as a consistent jumping off point for data definitions and categories, although it was not always possible to adhere to them, and in some cases it was necessary to transform source data to perform analysis. Information about the Common Education Data Standards (CEDS) is available at https://ceds.ed.gov/and is generally not provided/copied below. Also, the information provided below relates to the final analysis dataset in which only the 192,689 students who were appropriately drawn into the cohorts were retained, and the de-duplicated

enrollment, award and earning data that were in the academic terms and wage quarter periods covered by the study. There may be additional data considerations among the data for students who were excluded during data cleaning, about the source data supplied for identity resolution, or other things among the data used that would be relevant for other analyses that we did not perform.

Table 2. Cohort Student Records

Data Element	Data Description and Considerations
Social Security Number	Used by the NSC for identity resolution, removed from dataset provided to WICHE.
State/sector student ID	Used by the NSC for identity resolution, removed from dataset provided to WICHE.
First name	Used by the NSC for identity resolution, removed from dataset provided to WICHE.
Middle name	Used by the NSC for identity resolution, removed from dataset provided to WICHE.
Last name/Surname	Used by the NSC for identity resolution, removed from dataset provided to WICHE.
Generation code/Suffix	Used by the NSC for identity resolution, removed from dataset provided to WICHE.
Birth date	Not available for 881 students, and 335 students had more than one date of birth during identity resolution.
Sex	Not available for 2,275 students, and 182 students had more than one value for sex during identity resolution.
Race/ethnicity	Not available for 19,531 students. States were asked to provide data consistent with CEDS, under which race/ethnicity is classified by current federal education reporting standards, e.g., OMB 1997. But, the states and their respective education K-12 and postsecondary agencies were in various stages of transitioning to the current race/ethnicity classifications in 2004 to 2006, the time the cohort was extracted, making in infeasible to bridge the data consistently to the new classifications. Since our results are based on student classification in 2004-2005, there may be observable differences in the representation of students in our cohort, or in the student outcomes by race/ethnicity, compared to how students are currently classified.
ACT/CEEB code of high school	For Cohort A to be used for matching.
Date of high school diploma	For Cohort A to be used for matching.
Institutional IPEDS Unit ID	For Cohort B to be used for matching.
Institutional OPE ID	For Cohort B to be used for matching.
Date of first postsecondary enrollment	For Cohort B to be used for matching.
Exchange ID	Six-digit unique identifier representing a student, assigned by NSC after compiling and reconciling all cohort records using student identifying information, for linking across data components. Used with 'Source Code' field indicating which state(s) submitted the student, to assign the student to Cohort A and/or Cohort B. 1.23 percent of students occurred in more than one state's cohort, 58 Cohort A students were submitted by more than one state.

Note: This table highlights things observed during identity resolution or in the de-identified dataset.

Table 3. Term Enrollment Data

Data Element	Data Description and Considerations
Exchange ID	Six-digit number produced by NSC for linking across data components. See Table 2.
Institutional IPEDS Unit ID	For about 700 students (less than 0.5 percent), the initial enrollment was associated with a less-than-2-year institution or an administrative entity.
Academic Term Start Date/ Academic Term End Date	Specific chronological date was converted to academic terms as: Fall=Term began September 1 to December 31 Spring=Term began January 1 to April 30 Summer=Term began May 1 to August 31; terms begun in August that spanned less than two months. Criteria were determined to be sufficient to assign the vast majority of records to academic terms for the purposes of de-duplicating records, determining initial enrollment term and location, and for comparison to earnings data. Exceptions and outliers were handled on a case-by-case basis. More complex or precise criteria would be necessary to subset students and perform more in-depth analysis such as student transfer patterns.
CIP Code for First Program or First Major	Six digit CIP, as indicated during the respective term. Not present on data from the NSC.
Instructional Activity Hours Type	Credit or contact. Not present on data from the NSC.
Instructional Activity Hours Attempted	Not present on data from the NSC. Used primarily to prioritize multiple records per term, credits were computed as equal to Instructional Activity Hours Attempted except: • Multiplied by .75 if source was OR-University System • Hours attempted divided by 11 and multiplied by .75 if Instructional Activity Hours Type is 'Contact' and source is OR-Community College. • Hours attempted divided by 16 if type is Instructional Activity Hours Type is 'Contact' and source is HI. • If source is 'NSC' then use NSC Enrollment Status, and 12 credits if 'Fulltime', 6 credits if 'Halftime', and 3 credits if 'Less-than-halftime'.
Instructional Activity Hours Completed	Not present on records from the NSC or Washington.
Total Cumulative Credits Earned at start of term	Not present on records from the NSC or Washington.
Student Level	Student level in the respective term, Undergraduate or Graduate. Not present on records from the NSC.
Pell Recipient	Pell receipt in the respective term, Yes or No. Not present on records from the NSC. Missing for all Washington CTC enrollments. A flag affirming Pell receipt in AY2005-06 was patched on, but there remained discrepancy about this flag's coverage relative to the study cohort.
Degree-seeking Status	Degree-seeking status in the respective term. Not present on records from the NSC and 32 percent of the records from Washington.

Notes: Among 1,357,899 term enrollment records from the states and the NSC between April 2005 to August 2011. Unless otherwise indicated, the data element reflects the status of the student on that item in the respective term.

Table 4. Postsecondary Awards Data

Data Element	Data Description and Considerations
Exchange ID	Six-digit number for linking across data components. See Table 2.
Institutional IPEDS Unit ID	For the institution that conferred the award.
Academic Award Level	States supplied values were collapsed to the degree completion reporting categories as: • Associate's Degree • Bachelor's or higher = Bachelor's Degree, Postbaccalaureate Certificate, Master's Degree, Post-Master's Certificate, Doctor's Degree – Research/Scholarship, Doctor's Degree – Professional Practice, Doctor's Degree – Other Where reported, Certificate= Postsecondary award, certificate, or diploma of less than 1 academic year, Postsecondary award, certificate, or diploma of at least 1 but less than 2 academic years, or Postsecondary award, certificate, or diploma of at least 2 but less than 4 academic years NSC supplied values of Associates, Bachelors, Masters, Professional, PH.D., Certificate, Honors, Diploma, and Unidentifiable, which were mapped to state-supplied values. NSC 'Award Title' text field was used to recode a small number of 'Unidentifiable' awards.
Academic Award Date	Specific chronological date used to compare date of award to earnings data for mobility and earnings results.
CIP for Academic Award (six-digit)	Where grouped for those who earned a Bachelor's degree or higher, awards grouped at the two-digit CIP level as STEM (4, 11, 14, 15, 26, 27, 40, 41), Health (51), Business (52) and Other (all other), based on CIP codes for STEM and health professionals as identified by NCHEMS for National Governors Association metrics.

Notes: Among 104,094 postsecondary award records from the states and the NSC between April 2005 to August 2011. The states also supplied High School Graduation Date, High School Diploma Type (Regular or GED) and CEEB code for Cohort A students.

Table 5. Unemployment Insurance Quarterly Earnings Data

Data Element	Data Description and Considerations
Exchange ID	Six-digit number for linking across data components. See Table 2.
Year-Quarter	Missing on 264,737 records submitted to WICHE, 7 percent of all records, and wages were zero or missing on all of these records. They were removed from analysis. Coverage: HI: 2006Q1-2012Q3 ID: 2004Q1-2012Q2 OR: 2004Q1-2012Q3 WA: 2004Q1-2012Q2
Employment status	Yes or No. 'Yes' on all records except 1,299 for whom wages were also zero (removed).
Wages	For the 3 month quarter. Multiple records for student-state-quarter combination were summed to one record. Missing or zero on 12 records (removed).
Hours worked	For the 3 month quarter. Present on records from Oregon and Washington, not on records from Hawai'i or Idaho.
NAICS code	Six-digit North American Industry Classification System (NAICS).
Exchange Employer ID	Present on records from Oregon only.

Notes: Among 3,890,137 quarterly wage report records from establishments covered by unemployment insurance in Hawai'i, Idaho, Oregon and Washington.

Endnotes

[1] Brian T. Prescott and Peace Bransberger. *Knocking at the College Door: Projections of High School Graduates* (eighth edition). Boulder, CO: Western Interstate Commission for Higher Education, 2012, at www.wiche.edu.

[2] Andy Mehl, Statewide Longitudinal Data Systems Project Coordinator, Idaho Office of the State Board of Education, in email communications to author, March 2013.

[3] Jean Osumi at Multi-State Data Exchange Project Meeting, April 18, 2013, Boulder, CO.

[4] For more information about earnings not covered by unemployment insurance wage reports data, see for example, Zhang, Ting and Stevens, David, "Integrated Data System Person Identification: Accuracy Requirements and Methods", The Jacob France Institute, University of Baltimore: Baltimore, MD, 2012, accessed 7 May 2014 at http://www.jacob-france-institute.org/publications.php.

[5] Even after removing this large number of prior college students, there were another approximately 4,000 students with enrollments more than four years prior to May 1, 2005, i.e., before May 1, 2001, who were retained in the cohort and are presented in the findings results. (The states chose to retain them to be consistent with the NSC's prior college activity rules.) Forty-three percent of these retained prior college students had only one enrollment term and another 20 percent had only two terms.

[6] Afet Dundar, National Student Clearinghouse, "Prior Enrollment Flag Documentation" memo to author, April 2013.

[7] Of note, summer enrollments were somewhat more problematic, where term dates often overlapped Spring or Fall, as were other non-standard enrollments such as those indicating extremely short enrollments. Where Summer term end dates overlapped the Fall term definition, the records was considered for categorization as 'Fall'.

[8] See Appendix B for criteria.

[9] IPEDS ID was used to describe the enrollment and award institution's control, level and state by linking institutional characteristics from each IEPDS header ('HD') files, by IPEDS ID and academic year.

[10] Hawai'i's UI system only actively maintains six years of data in it production database, so Hawai'i provided data beginning with 2006 Quarter 1. Including data provided directly by Hawai'i's Unemployment Insurance Division and data supplemented by University of Hawai'i from a separate study of its students.

[11] 266,048 records were removed because a combination of Employment Status was 'No' or Wages were zero or missing, about 7 percent of all the raw earnings records received.

[12] There was no discernible difference in SSN availability for those who enrolled but didn't complete a degree compared to those who completed a degree, 81 percent and 82 percent, respectively. We also arrived at an SSN for about 7,000 of the high school graduates in Oregon and Washington who did not go to college, resulting from the data/student matching process and intermittent availability that has since become impermissible.

[13] For college degree-earners, this might also be considered 'enrolled subsequent to degree', but we did not specifically analyze subsequent enrollment patterns; the results only focus on the snapshot of post-degree earnings and enrollment specifically 10-12 months later.

[14] See for example, BLS indications of coverage (nationally): "Chapter 5. Employment and Wages Covered by Unemployment Insurance", http://www.bls.gov/opub/hom/homch5_itc.htm.

[15] UI earnings data relate to location of the reporting business establishment, which might not always represent the physical work location. e.g., in cases such as branch or franchise locations reporting under a headquarters or other single location, or employees that work remotely. We did not receive the necessary data (FEIN) to isolate earnings reports from multi-establishments.

[16] For example, quarterly earnings of less than $7.25 (one hour paid at Federal minimum wage) or quarterly earnings that would suggest a monthly full-time salary of $80,000 or more (an unlikely earnings level for first-time college graduates).

Appendix B. National Student Clearinghouse Data Preparation and Coverage

The following information was provided to WICHE by the National Student Clearinghouse (NSC) to describe the coverage of the data it contributed to the MLDE project and some of the key methods the NSC used in managing the MLDE data compilation as a subcontractor to the MLDE project, including passing data through its StudentTracker process.

Importing Data

The NSC Research Center makes reasonable attempts to accept and correctly read incoming data by:

1. Providing each state or agency with a secure FTP mailbox for file uploads.
2. Importing the data into SAS.
3. Running diagnostics to assess the quantity and quality of data elements.
4. Reviewing (sometimes manually) any data that appears missing or invalid as a result of diagnostics.
5. Making common-sense changes to the data when deemed necessary, while keeping a written record of these changes. Some of these changes included: recoding sex and gender variables, removing leading spaces, adding leading zeroes, switching month and day in date fields, etc.

However, if NSC is unable to determine the correct value or format for a data element, this would not be accepted. For example, a series of dashes in a date field would not be processed.

FERPA

This project is covered by the studies exception. Therefore,

- SSNs are used in StudentTracker matching, and
- Non-directory or blocked information is returned by StudentTracker.

Matching

The NSC Research Center performs a three-step matching procedure.

Step 1 – Merging the cohort files

Records contained in cohort files are exact matched on First Name, Middle Name, Last Name, Name Suffix, and DOB. An initial exchange ID is assigned to each student based on this matching.

Step 2 – Merging via StudentTracker

Records contained in cohort files are run through StudentTracker. This step includes multiple records for students with more than one valid SSN (e.g. one in the cohort file and another in the additional SSN file). Students who cannot be submitted to the StudentTracker match process include: students missing either first or last name as well as students missing both a valid SSN and birth date.

Note: StudentTracker matching logic in step 2 may make further links between students who were not previously matched during step 1. On the other hand, StudentTracker matching logic in step 2 will not be allowed to break a link previously created in step 1. In these cases, separate tiebreaker logic is

implemented by giving preference to matches based on SSN first, then to matches made to students whose first enrollment after the search date was in one of the four pilot states, and lastly at random.

Step 3 – Merging students with 1 single shared SSN

Students who are flagged as having only 1 SSN and sharing this SSN with another student are further matched based on exact SSN, First Name, Last Name, and DOB. This step helps to match students across cohorts even if the student was not found in the StudentTracker database. Once this step is completed, a final exchange ID is assigned to each student.

Returning Data

The NSC Research Center returns all data received during the project as specified by the data sharing agreements signed between the states, WICHE, and NSC.

Raw data

Datasets containing raw data are returned in long format. These contain every row of data received during the project, along with a source code for each row and a unifying exchange ID assigned based on matching procedures. When joining different types of files, data fields that existed in one type of incoming file, but not in another, are present in the final file but are blank when not applicable.

Derived variables

Datasets containing NSC-computed derived variables are returned in wide format. These contain one row of data per exchange ID.

Datasets compiled by NSC and returned the same to all states:

- Merged Cohort
- Merged Cohort for Labor Agencies (with additional SSNs)

Datasets compiled by NSC and returned individualized to each state agency:

- Core Exchange PII files, which includes all data received for students in each original cohort only
- Hawai‘i labor data file (sent to University of Hawai‘i for distribution to other states)

Datasets compiled by NSC and returned to WICHE:

- Unidentified file
- Derived variable file

Table 3. National Student Clearinghouse Coverage Rates

State	Sector_desc	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011
U.S.	Overall	88.2%	89.1%	90.7%	91.6%	92.0%	93.1%	94.0%
U.S.	All 4-year Institutions	89.8	90.4	92.1	92.5	93.1	93.5	94.2
	All 2-year Institutions	85.3	86.8	88.2	90.1	90.2	92.3	93.5
	All Public Institutions	91.9	92.7	94.3	95.8	96.5	98.3	98.7
	All Private, not-for-profit Institutions	84.8	86.5	88.9	90.2	92.5	92.8	92.7
	All Private, for-profit Institutions	52.0	52.3	54.6	55.4	55.6	53.7	60.2
	Public, 4-year	94.7	95.0	96.7	97.7	98.3	99.3	99.5
	Private, not-for-profit, 4-year	85.3	86.9	89.5	90.7	93.0	93.3	93.3
	Private, for-profit, 4-year	66.5	65.2	66.1	65.5	66.5	64.7	69.2
	Public, 2-year	88.8	90.2	91.5	93.7	94.6	97.3	97.7
	Private, not-for-profit, 2-year	44.4	47.9	34.2	35.4	36.0	37.0	31.8
	Private, for-profit, 2-year	10.2	11.0	13.6	15.3	14.1	13.2	24.8
Hawai'i	Overall	81.8	85.9	86.6	87.0	88.0	88.8	88.4
	All 4-year Institutions	72.5	78.7	78.9	78.9	79.9	80.8	80.3
	All 2-year Institutions	98.4	98.7	99.9	100.0	100.0	100.0	100.0
	All Public Institutions	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	All Private, not-for-profit Institutions	23.1	42.7	38.7	38.0	38.9	40.2	39.6
	All Private, for-profit Institutions	0.0	0.0	57.6	64.5	68.0	98.1	97.7
	Public, 4-year	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Private, not-for-profit, 4-year	18.5	39.2	38.7	38.0	38.9	40.2	39.6
	Private, for-profit, 4-year	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Public, 2-year	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Private, not-for-profit, 2-year	96.6	98.5	.	.	.	.	.
	Private, for-profit, 2-year	0.0	0.0	96.6	100.0	100.0	100.0	100.0
Idaho	Overall	98.0	97.8	97.9	97.5	96.2	96.6	96.8
	All 4-year Institutions	98.5	98.4	98.4	98.3	97.5	96.9	96.8
	All 2-year Institutions	95.9	94.9	95.4	94.0	91.1	95.0	96.8
	All Public Institutions	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	All Private, not-for-profit Institutions	93.7	94.0	93.9	93.6	93.4	93.2	94.2
	All Private, for-profit Institutions	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Public, 4-year	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Private, not-for-profit, 4-year	93.7	94.0	93.9	93.6	93.4	93.2	94.2
	Private, for-profit, 4-year	.	.	.	.	0.0	0.0	0.0
	Public, 2-year	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Private, not-for-profit, 2-year	.	.	.	.	.	.	.
	Private, for-profit, 2-year	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oregon	Overall	90.2	90.1	90.1	91.4	91.0	96.6	96.2
	All 4-year Institutions	91.9	92.0	91.8	93.4	93.3	96.0	95.7

State	Sector_desc	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011
	All 2-year Institutions	88.0	87.4	87.7	88.7	88.3	97.2	96.7
	All Public Institutions	94.0	94.1	93.9	94.4	94.3	100.0	99.4
	All Private, not-for-profit Institutions	85.5	85.7	85.3	91.7	92.0	92.0	91.9
	All Private, for-profit Institutions	0.0	0.0	3.7	6.9	8.6	16.3	35.4
	Public, 4-year	97.0	97.1	97.1	97.3	97.3	100.0	100.0
	Private, not-for-profit, 4-year	85.4	85.7	85.3	91.7	92.0	92.0	91.9
	Private, for-profit, 4-year	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Public, 2-year	90.9	90.7	90.6	91.6	91.7	100.0	98.9
	Private, not-for-profit, 2-year	100.0	100.0	.	.	.	.	.
	Private, for-profit, 2-year	0.0	0.0	7.3	12.9	14.9	26.7	55.6
Washington	Overall	96.4	97.6	97.9	97.9	97.3	96.8	97.4
	All 4-year Institutions	92.8	95.5	96.5	96.8	97.1	96.8	96.8
	All 2-year Institutions	99.3	99.3	99.5	99.1	97.6	96.9	98.3
	All Public Institutions	99.8	99.8	99.8	99.8	99.8	99.8	99.8
	All Private, not-for-profit Institutions	82.7	93.0	95.2	95.6	95.3	94.0	93.5
	All Private, for-profit Institutions	28.4	28.6	29.4	29.2	28.6	16.5	36.9
	Public, 4-year	100.0	100.0	99.6	99.6	99.6	99.6	99.6
	Private, not-for-profit, 4-year	82.7	93.0	95.2	95.6	95.3	94.0	93.6
	Private, for-profit, 4-year	25.6	24.4	26.1	30.4	39.6	31.7	30.7
	Public, 2-year	99.7	99.7	100.0	100.0	100.0	100.0	100.0
	Private, not-for-profit, 2-year	.	.	.	.	.	0.0	0.0
	Private, for-profit, 2-year	39.1	47.9	40.9	26.1	12.9	0.0	43.8

Notes on Enrollment Coverage Rates: Cells are populated with '.' for cases where there are no institutions in the denominator. Sector extracted from historical IPEDS institutional characteristics. Data reflect institutional changes in sector over time. State comes from NSC profiles (not IPEDS institutional characteristics) so that coverage percentages can be applied to NSC postsecondary data in order to adjust for changes in coverage over time. An institution is determined to be covered in any given fall year if the Data_Since_Dt is on or before Oct 15 of a given academic year (since coverage is based on IPEDS enrollments which have an Oct 15 snapshot date). Source: NSC School Profiles as of 12/30/13.

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