Colorado Helps Advanced Manufacturing Program

Student Profiles, and Academic and Employment Outcomes

Li Kuang and Heather McKay

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RUTGERS
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INTRODUCTION

In the fall of 2013, the Colorado Community College System (CCCS) received a four-year United States Department of Labor (USDOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant for its Colorado Helps Advanced Manufacturing Program (CHAMP) project. The principal goal of CHAMP was the creation or redesign of degree and certificate programs to effectively respond to 21st-century manufacturing needs and to create employment opportunities beyond traditional-sector trajectories. Under CHAMP, a consortium of nine Colorado colleges[1] partnered with employers and regional industries with the goal of developing and enhancing academic programs to meet changing employer requirements and more quickly and efficiently prepare and credential workers. Strategies used under the grant included establishing college–industry and workforce partnerships; purchasing manufacturing equipment; creating a website featuring local labor market information; developing articulation agreements; developing hybrid and online curriculum using open educational resources; supporting students through the pathway from education to employment using navigators; and standardizing practices and policies with regard to the awarding of credit for prior learning. In addition, to facilitating students' movement into the job market, the CHAMP grant mandated the employment of a "navigator" to advise and support students to increase their rates of retention and completion, and to help students make more informed decisions about their academic and career paths, and prepare students to engage in employment searches and enter the job market.

This report, prepared by the grant program's third-party evaluator, Rutgers School of Management and Labor Relations' Education and Employment Research Center (EERC), complements other reports prepared by EERC about the CHAMP project (see https://smlr.rutgers.edu/content/publications-0). This brief presents EERC's quantitative analysis of CHAMP students' enrollment, academic achievement, and employment outcomes. The brief ends with a summary of key findings and the identification of next steps.
In this report we define a "CHAMP student" as any individual who enrolled in at least one course identified by the colleges as part of a CHAMP program of study.[2] In the following pages, we will discuss the details of these three broad domains.

- *Student enrollment and demographics*: CHAMP students' sociodemographic background (gender, race/ethnicity, age), registration status at first CHAMP enrollment, financial aid status, and military background.

[1] The CHAMP consortium includes seven community colleges: Aims Community College (Aims), Community College of Denver (CCD),), Front Range Community College (FRCC), Lamar Community College (LCC), Pikes Peak Community College (PPCC), Pueblo Community College (PCC), and Red Rock Community College (RRCC). And one technical colleges - Emily Griffith Technical College (EGTC). The ninth member of the consortium, Metro State University, Denver (MSU), is the four–year university to which students can apply CHAMP credits toward earning a bachelor's degree in engineering.

[2] A CHAMP developed or redesigned course.

- *Academic achievement*: CHAMP students' graduation rate, number of credentials earned, time elapsed from initial enrollment to first credential, and students' retention rates.
- *Employment*: CHAMP students' employment status when they first enrolled in a CHAMP program (*incumbent worker* or *non-incumbent worker*); and the employment of non-incumbent worker students after they earned their first credential. In addition, wage increases for incumbent worker students' post-enrollment in CHAMP regardless if they earned a credential.

Data

Enrollment in CHAMP programs began in the spring of 2014. The report's study period thus extends from spring 2014 through fall 2016.

All nine CHAMP colleges are included in the study: Aims, Community College of Denver (CCD), Emily Griffith Technical College(EGTC), Front Range Community College (FRCC), Lamar Community College (LCC), Pueblo Community College (PCC), Pikes Peak Community College (PPCC), Red Rocks Community College (RRCC), and Metro State University of Denver (MSU). With the exception of MSU and EGTC, all CHAMP participating colleges were community colleges. The community colleges conferred short-term (within one year) certificates, long-term (between one and two-years), as well as associate degrees. MSU, a 4-year university, offered short-term certificates and bachelor's degrees. EGTC a technical college, offered short-term certificates.

Quantitative data used in this final report were collected from the Colorado Community College System (CCCS) on behalf of the system schools (CCD, FRCC, LCC, PCC, PPCC). In addition, EERC received data directly from the three non-CCCS schools—Aims, EGTC, and MSU.

The data retrieved from the above sources includes CHAMP student registration information, course history, and graduation information. It also includes demographic information, e.g., race/ethnicity, gender, age, disability status, military experience, and financial aid status using Pell eligibility as a proxy.

Employment and wage data for CHAMP students was obtained through a data-sharing agreement with the Colorado Department of Labor and Employment.

For the CHAMP courses redesigned or created under the CHAMP grant, EERC used a list of course compiled by CCCS and each of the non-system schools. From this course list, EERC generated college lists which were then confirmed by each college's CHAMP project lead. Data collection for the final report was pulled from all data sources in March of 2017 and included data through the fall 2016 semester. No spring and summer 2017 data have been included in our analysis. For the report study period, EERC identified a total of 4,354 students as CHAMP enrollees.

CHAMP enrollees primarily represents students taking credit coursework with the exception of the data from FRCC which includes non-credit students. The inclusion of these non-credit students may skew graduation and completion rates at FRCC. CCD also had non-credit students in their program, but that data was not available at the time of analysis.
In the sections below, for each research question, we report our findings at the CHAMP consortium level as well as at the college level.

Study Limitations

There are a number of limitations of which the reader needs to be mindful.

College Calendars and Course Offerings: Colleges did not necessarily have the same semester start and end dates. Further, not all colleges offered CHAMP courses during the summer. The mismatch of colleges across CHAMP may introduce errors in the calculation of time to credential/degree, the semesters in which students graduated, and rates of student employment upon graduation.

Demographic Characteristics: Students self-report on a number of demographic characteristics (birth date, gender, race/ethnicity) including military background, Pell status, and disability. Self-reported data are not always reliable. There can be errors in reporting or missing data. Therefore, it is not known whether missing data on military background, Pell status, and disability conditions reflected the fact that students did not have these experiences, or they just were not recorded. In the current analysis, EERC considers any student who did not provide information on Pell status, military background, and disability status as not having these characteristics or experiences.

Size of CHAMP student population: Consortium colleges included both rural and urban campuses and ranged from small to large. Student populations thus varied. In addition, larger colleges tend to have access to more institutional resources, including teaching faculty, than the smaller ones. As such, they may be able to attract and enroll more students. Within this context, EERC found wide variations in the number of students enrolled in CHAMP. Readers are therefore cautioned about interpreting some of the consortium level results, i.e., one or two colleges' experiences may strongly influence the aggregated statistics.

Time Censoring: Time censoring in data collection was a problem for EERC's analysis. Students enrolled at different times in CHAMP courses – some beginning as late as fall 2016. The more time elapsed from a student's initial entrance into a CHAMP course of study, the greater the chance the student completed a program of study and entered into employment. EERC was thus better able to capture students' academic and employment outcomes for the earlier cohorts than their counterparts in the later cohorts. As a result, this report may underestimate graduation and employment rates. To better evaluate the academic and employment outcomes for all CHAMP students, further follow-up data collection and research are needed.

College CHAMP Program Offerings: Colleges did not all offer the same type of credential, and some colleges structured their programs to be a sequence of stacked credentials towards an associate's degree. Thus, while EERC does do some comparisons between the colleges, the reader needs to be mindful that credentials differ in the time needed to complete, e.g., one-semester short-term certificate to four or more years for a bachelor's degree.

Intersection of Various Student Characteristics: This section presents a broad profile of the CHAMP student populations without analyzing the intersections of different demographic characteristics. For example, individuals who served in the military may be older than those who did not. We present outcomes for each of these characteristic separately when in fact there may be some relationship, e.g., between age and military background.

POPULATION PROFILE - ENROLLMENT AND DEMOGRAPHICS

This section begins with the numbers of students[3] enrolled in each CHAMP program year beginning with spring 2014 and ending fall 2016. We then present students' demographic characteristics including, Pell eligibility, employment experiences, and military background. All data are reported for the CHAMP consortium as a whole and for each individual CHAMP institution.

Number of new students over time

During the EERC study period — between spring 2014 and fall 2016 – a total of 4,354 unique students enrolled in one or more CHAMP courses.[4]

Table 1 presents the number of first-time CHAMP enrollees for each semester from spring 2014 through fall 2016. The first semester of CHAMP programs, spring 2014, attracted the largest number of enrollees, 823 or 19 percent of all enrollees. Subsequently, except for fall 2016, the fall and spring semesters evidenced fairly stable numbers of enrollees (about 600 each) or about 14 percent. Summer enrollment rates were lower, in part affected by the number of courses offered by colleges each summer.

The pattern of first-time CHAMP enrollees suggests that CHAMP programs were successful in attracting new students. This is especially the case for the first semester CHAMP was launched when a significant amount of preparatory marketing took place. However, despite significant initial interest in the program and the colleges launching additional credentials plus purchasing new state of the art equipment, the number of new enrollees decreased as the CHAMP grant began to sunset. This reduction in enrollment may be the result of a variety of factors including the reality that many CHAMP staff, especially the navigators were transitioning at this time. It

[3] EERC only includes students who were sixteen years of age or older.
[4] We define CHAMP enrollment by taking CHAMP redesigned or new courses.

also aligns with declining enrollments across community colleges as the economy began to improve. Thus both summer and fall numbers are considerably below prior terms.

Note, in our analysis, we used academic years which includes the fall, spring and summer terms, and labeled the academic year by the year in which it ends. Thus, 2014 refers to spring 2014 and summer 2014 enrollees, while 2015 includes fall 2014 and spring and summer 2015 enrollees.

Given that the 2014 academic year had only two terms (spring and summer 2014) in the study period, and the 2016 academic year only had one term (fall 2016), the reader should use caution when comparing the 2014 and 2017 years with the other years.

Table 1. New Unique CHAMP Enrollees cross the CHAMP Consortium by Semester

Academic year	Semester	# CHAMP Enrollees	% of all CHAMP enrollees
2014	**Spring 2014**	823	18.9%
	Summer 2014	152	3.5%
2015	**Fall 2014**	615	14.1%
	Spring 2015	610	14.0%
	Summer 2015	128	2.9%
2016	**Fall 2015**	727	16.7%
	Spring 2016	644	14.8%
	Summer 2016	92	2.1%
2017	**Fall 2016**	563	12.9%

Table 2 below presents the number of new enrollees by college by academic year. The total number of CHAMP students served by the grant varied by institution, ranging from 131 students at LCC (the smallest of the CHAMP colleges) to 864 students at Aims. The trend of enrollment over time varied across schools. Comparing new enrollees for academic years 2015 and 2016 (fall, spring, and summer semesters), we find that Aims, LCC, MSU, and PPCC experienced a decrease in enrollment while CCD, FRCC, and especially RRCC experienced increases. At RRCC, the number of new enrollees in year 2016 was in fact over four times as large as their 2015 enrollments. Enrollment increases most likely reflect a college's delayed implementation of CHAMP courses and/or the addition of new CHAMP programs, e.g., CCD and RRCC.

Table 2. CHAMP Enrollees in Each Academic Year

CHAMP school	Academic Year				Total	% of CHAMP Total Enrollment
	2014 *Spring/ Summer*	**2015** *Fall/ Spring/ Summer*	**2016** *Fall/ Spring/ Summer*	**2017** *Fall*		
AIMS	255	291	245	73	864	19.8%
CCD	71	120	113	70	374	8.6%
EGTC	0	87	87	62	236	5.4%
FRCC	64	142	152	46	404	9.3%
LCC	18	39	28	46	131	3.0%
MSU	198	205	191	82	676	15.5%
PCC	125	193	194	85	597	13.7%
PPCC	206	214	190	48	658	15.1%
RRCC	38	62	263	51	414	9.5%
Total	975	1353	1463	563	4354	100%

Demographics of the Consortium

The demographic characteristics of CHAMP enrollees for the full consortium are presented in Table 3, while Table 4 breaks down the statistic by individual college.

The majority of CHAMP students were male, 85.4 percent; 15 percent were female. A greater proportion of the CHAMP population were white, 69 percent, followed by 22 percent Hispanic students, and 4 percent black students. There were few Asian and American Indian/Alaska native[5] students, 2.6 percent and 2.0 percent respectively.

There was a wide age range among CHAMP students - 16 years of age to 74 years old. The average age for all students was about 28. Using the National Center for Educational Statistics' (NCES) definition of *traditional* (under 25 years old) and *non-traditional* students (25 years of age and older),[6] EERC found that just under 48 percent of the CHAMP population were non-traditional students. This proportion of non-traditional students is slightly higher than the overall CCCS system of 41 percent,[7] no doubt reflecting higher numbers of incumbent workers returning to college to upgrade their credentials in advanced manufacturing.

Few CHAMP students reported they had a disability (n=86 students or 2 percent of all students).

[5] This was the term used in the data set

[6] See NCES website: https://nces.ed.gov/pubs/web/97578e.asp

[7] See CCCS website: https://www.cccs.edu/about-cccs/college-fact-sheets/colorado-community-college-system-fact-sheet/

Nine percent of the CHAMP population reported having a military background. Half of the CHAMP students with military background/experience were enrolled at PPCC (N= 202). This is not surprising, given PPCC's proximity to several military bases, and a community with a large number of active military, veterans, and their families.

Forty percent of the CHAMP student population received Pell assistance.

Table 3. Demographic Characteristics of CHAMP Students[8]

Demographics	N	Percentage
Gender		
Male	3702	85.4%
Female	635	14.6%
Total	*4337*	*100.0%*
Race/ethnicity[9]		
White	2554	69.0%
Black	132	3.6%
Hispanic	807	21.8%
Asian	96	2.6%
American Indian/Alaska Native	75	2.0%
Other	37	1.0%
Total	*3701*	*100.0%*
Age		
Traditional student	2274	52.3%
Non-traditional student	2077	47.7%
Total	4351	100.0%
Registration status		
Full time	2127	52.6%
Part time	1918	47.4%
Total	*4045*	*100.0%*
Disability status		
With disability	86	2.0%
No disability	4268	98.0%
Total	*4354*	*100.0%*
Military background		
With military background	397	9.1%
No military background	3957	90.9%
Total	*4354*	*100.0%*
Financial aid assistance		
With Pell	1727	39.7%
No Pell	2627	60.3%
Total	*4354*	*100.0%*

[8] Total n under each category varies as a result of missing data.

[9] 15 percent of the data on race/ethnicity as missing from the pulled data set.

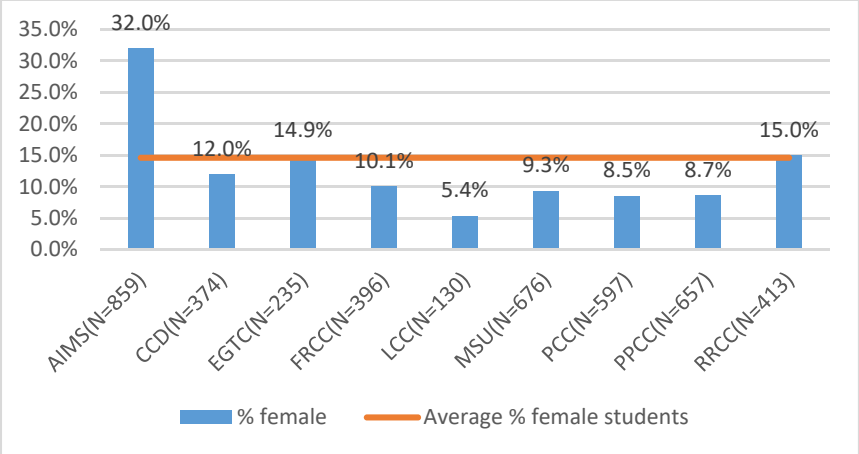
Demographic characteristics by school

In this section, we analyze CHAMP students' demographic characteristics, registration status, financial aid condition, and military status by individual college. The statistics in this section show the variation in student populations across CHAMP schools that may reflect the different makeup of the college's general student population, as much the attraction of CHAMP programs.

Gender

Figure 1 shows the distribution of female CHAMP students in each school. As indicated above, across the CHAMP consortium, there were far fewer female CHAMP students than male students. On a college level, EERC found more variations in the percent of female students - 5.4 percent at LCC as compared to Aims, 32 percent. The proportions of female students at EGTC and RRCC were at the consortium average (14.6 percent). Contextually, while more women typically attend Colorado's community colleges, 55 percent of enrollment[10], not many are enrolling in advanced manufacturing courses.

Figure 1. Gender, Proportion of Female Students by School



Race/ethnicity

CHAMP schools reported six racial categories: white, black, Hispanic, Asian, American Indian/Alaskan Native, and other racial groups. Although the reported racial categories were

[10] See https://www.cccs.edu/about-cccs/college-fact-sheets/colorado-community-college-system-fact-sheet/

slightly different between CCCS and non-CCCS schools[11], EERC was able to code them consistently across schools. Table 4 shows the average percent of the six racial/ethnic categories.

Table 4. Mean Race/ethnicity Across the CHAMP Consortium[12]

	White	American Indian/ Alaskan Native	Asian	Black	Hispanic	Other	Total
Number	2554	75	96	132	807	37	3701
Consortium Mean Percent	69%	2%	2.6%	3.6%	21.8%	1%	100%

Table 5 presents the racial/ethnic distributions for each college – numbers and proportional percent. There are some significant population variations across the colleges. To some extent, this reflects regional differences – urban and rural communities, and the type of college. EGTC had the largest percentage of minority students (53.2 percent). This may be a result of the college's work with immigrant and refugee populations. Almost 40 percent of CHAMP students at PCC, Aims, and MSU were minorities as well, 39.2 percent, 35.1 percent, and 37.1 percent respectively. In contrast, 80 percent of RRCC and FRCC students were white.[13]

[11] For example, CCCS would document black non-Hispanic, non-CCCS schools may only report as black African American.

[12] As noted above, the data sets only included race/ethnicity for 85 percent of CHAMP students.

[13] As a comparison, CCCS reports 35 percent minority population across its 13 community colleges. See https://www.cccs.edu/about-cccs/college-fact-sheets/colorado-community-college-system-fact-sheet/

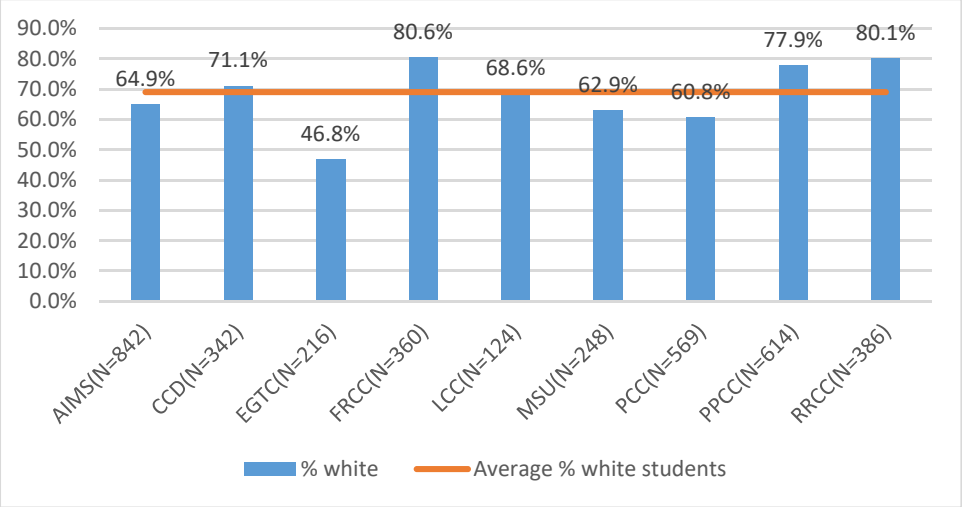
Table 5. Distribution of CHAMP Students by Race/ethnicity

CHAMP School	White		American Indian /Alaskan Native		Asian		Black		Hispanic		Other		Total N
	N	%	N	%	N	%	N	%	N	%	N	%	
AIMS	546	64.9%	3	0.4%	9	1.1%	19	2.3%	265	31.5%		-	842
CCD	243	71.1%	8	2.3%	13	3.8%	21	6.1%	56	16.4%	1	0.3%	342
EGTC	101	46.8%	1	0.5%	4	1.9%	24	11.1%	73	33.8%	13	6.0%	216
FRCC	290	80.6%	8	2.2%	22	6.1%	3	0.8%	37	10.3%		-	360
LCC	85	68.6%	3	2.4%	1	0.8%	3	2.4%	32	25.8%		-	124
MSU	156	62.9%	2	0.8%	10	4.0%	12	4.8%	48	19.4%	20	8.1%	248
PCC	346	60.8%	30	5.3%	5	0.9%	16	2.8%	171	30.1%	1	0.2%	569
PPCC	478	77.9%	17	2.8%	17	2.8%	33	5.4%	69	11.2%		-	614
RRCC	309	80.1%	3	0.8%	15	3.9%	1	0.3%	56	14.5%	2	0.5%	386
Total	2554		75		96		132		807		37		3701

White CHAMP Students

Over 69 percent of the 3,701 CHAMP students who reported their race/ethnicity were white (see Table 4). However, the percent of white students varied across the CHAMP schools, ranging from 47 percent at EGTC to 81 percent at FRCC. FRCC, PPCC, and RRCC had significantly larger than average proportion of white students, while Aims, MSU, and PCC had smaller proportions of white students.

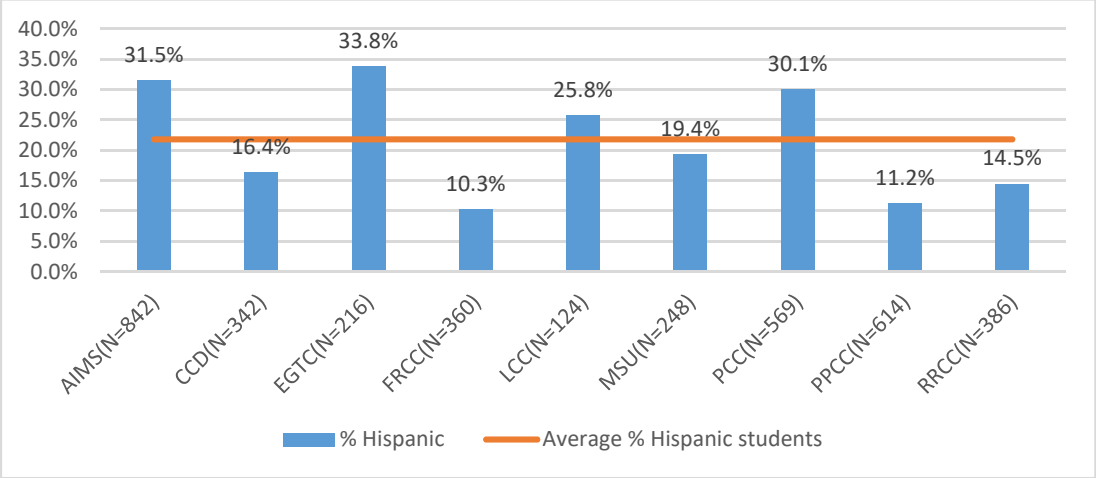
Figure 2. Proportion of White CHAMP Students by School



Hispanic CHAMP Students

Across the consortium, Hispanic students were the next largest racial/ethnic group enrolled in CHAMP courses (22 percent). But again there were differences by college. Aims, EGTC, and PCC each had Hispanic enrollments over 30 percent. At LCC, about 26 percent of CHAMP students were Hispanic. FRCC and PPCC, however, had lower proportions of Hispanic students, 10 and 11 percent respectively. See Figure 3 below.

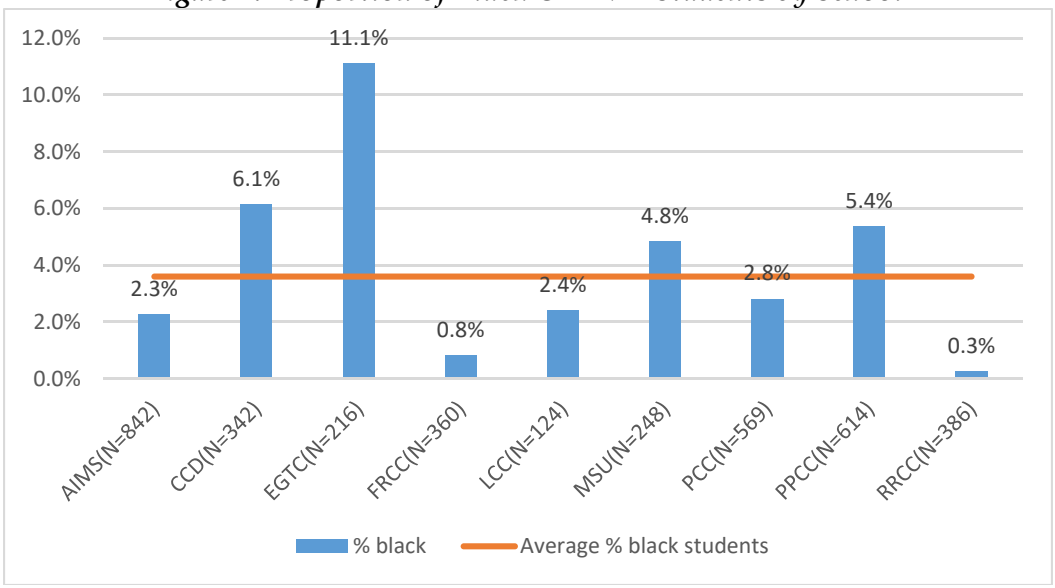
Figure 3. Proportion of Hispanic CHAMP Students by School



Black CHAMP students

Black students represented less than 4 percent of CHAMP students across the nine consortium colleges (Figure 4). Compared with other schools, EGTC had a higher proportion of black students (11 percent). Other schools with more than the consortium average for black students were CCD (6.1 percent), MSU (4.8 percent), PPCC (5.4 percent).) At the same time, Aims, LCC, and PCC had a little over 2 percent black CHAMP students. Both FRCC and RRCC had less than 1 percent black CHAMP students (1 percent and 0.3 percent respectively).

Figure 4. Proportion of Black CHAMP Students by School



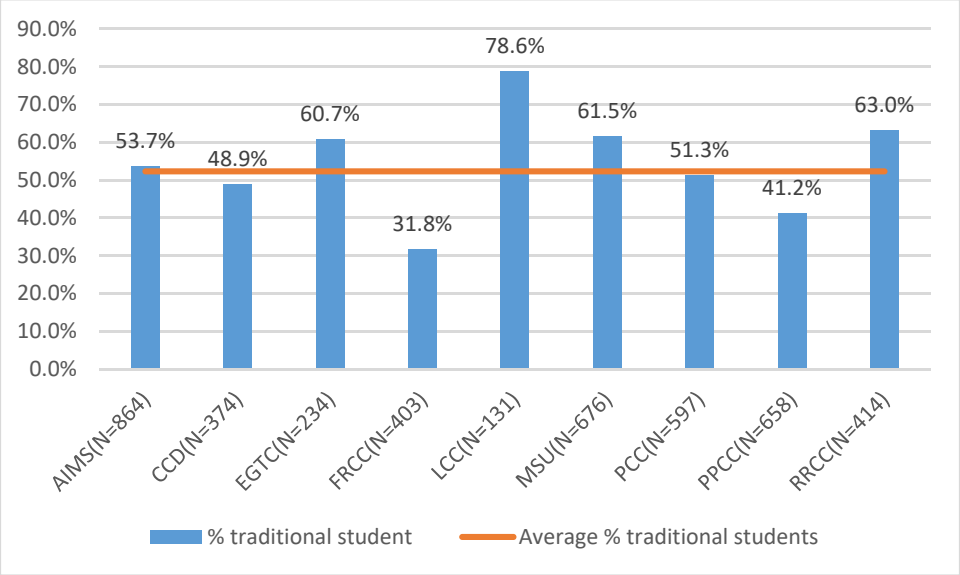
In summary, there were far fewer minority students across the CHAMP continuum than white students. However, the numbers varied by college with EGTC having the most diverse student population, and FRCC and RRCC having the least diverse.

Age

The mean age of all CHAMP students was 28 years old. As with other demographic characteristics, there was a significant variation in the age of CHAMP students - from 16 to 74, across the colleges.

Figure 5 presents the proportion of traditional students enrolled in CHAMP courses across the consortium. Using the threshold of 25 to define *traditional* vs. *non-traditional* students, we find close to 52 percent of CHAMP students were traditional-age. However, 79 percent of CHAMP students enrolled at LCC were traditional age students. In contrast, PPCC and FRCC had the smallest proportions of traditional students, 41 percent, and 32 percent respectively. At PPCC the age of students may be affected by the large number of current and former military attending the college. At FRCC, the CHAMP program included non-credit programs which was attractive to incumbent workers.[14]

Figure 5. Proportion of Traditional Student by School

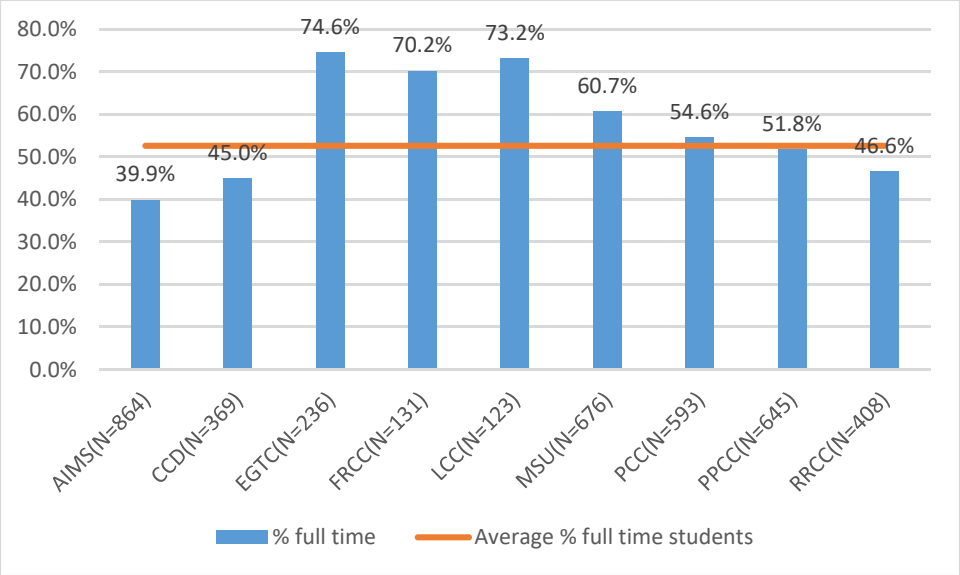


[14] 280 out of 404 CHAMP students (69 percent) were enrolled in non-credit courses; and incumbent workers tend to be older.

Registration status[15]

ERRC received registration status (full time or part time) for 4,045 CHAMP students. This status was recorded when students first registered for a CHAMP course and thus does not reflect any possible changes after their first semester in CHAMP. Just over half of CHAMP students enrolled as full-time students (52.6 percent). But once again there was variation across the CHAMP institutions. At Aims, the largest enrollments of the CHAMP schools, 40 percent of CHAMP students were full-time. At schools with smaller CHAMP enrollments such as EGTC, FRCC[16], and LCC,[17] there were much higher proportions of full-time students than part-time students, 74.6 percent, 70.2 percent and 73.2 percent, respectively. In contrast, at CCD and RRCC, fewer students registered as full-time, only 45 and 47 percent respectively.

Figure 6. Proportion of Full-Time CHAMP Students by School



Linking the data presented in Figure 5 above with that in Figure 6, EERC found that colleges with larger proportions of traditional students also had larger proportions of full-time students.[18]

[15] FRCC offered non-credit CHAMP courses. The school is a special case. At FRCC 280 students enrolled in non-credit CHAMP courses, thus not registering for credits. As such, these students were excluded in EERC's analysis of registration status. However, these 280 non-credit students are included in the analysis of demographics and other non-academic related analyses.

[16] See footnote 12. We only consider 131 FRCC students' registration status.

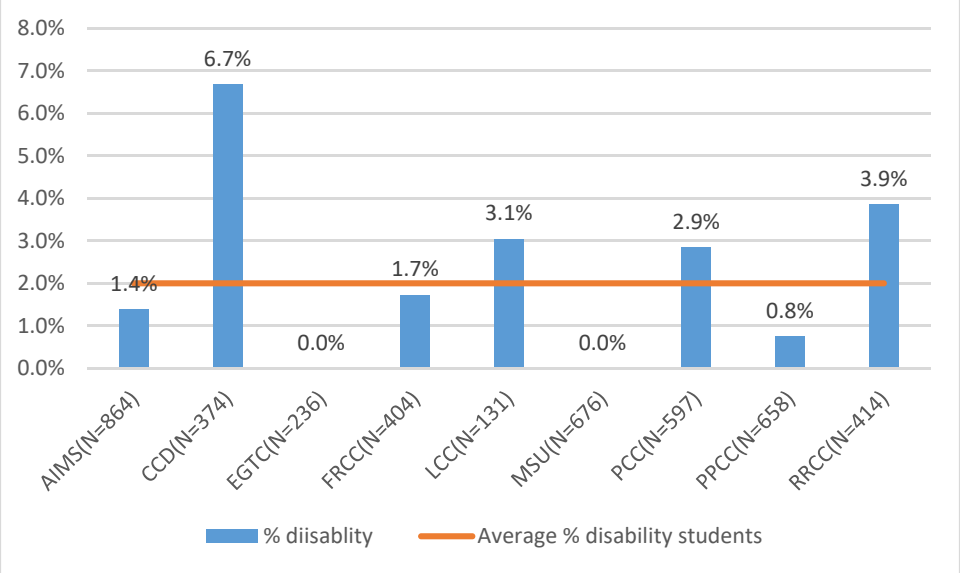
[17] Note, LCC is both a residential and commuter college the only one in the consortium that has residential students.

[18] See footnote 12 for FRCC.

Disability status

Only 82 CHAMP students reported that they had some physical or mental disability.[19] Looking across the CHAMP consortium, the average percentage of students reporting one or more disabilities was 2. Figure 7 shows the proportion by college. CCD had the highest proportion, 6.7 percent; followed LCC, PCC and RRCC, 3.9 percent, 3.1 percent and 2.9 percent respectively. None of the students in EGTC or MSU reported a disability. Disability status is often not self-reported by students.

Figure 7. Proportion of CHAMP Students Reporting Disability by School

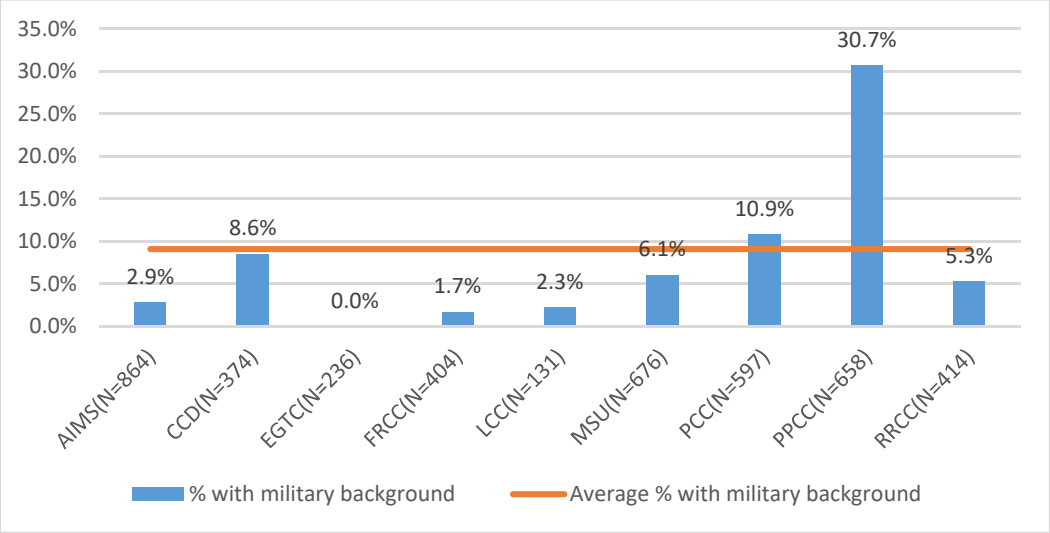


Military background

Nine percent of all CHAMP students had some military experience. This is higher than the system average of 6 percent with military experience. However, some colleges like EGTC reported no students with a military background, and others like PPCC, which is near several military bases, reported 31 percent of its CHAMP students were currently in the military or were veterans. In the general population at PPCC, 20 percent of students have military experience. More typical were the colleges such as Aims, FRCC, LCC, and RRCC which reported less than 5 percent of students with some military experiences (Figure 8).

[19] Disability status is self-reported so this may be an under count of individuals who actually have a physical and/or mental disability.

Figure 8. Proportion of CHAMP Students with Military Background by School



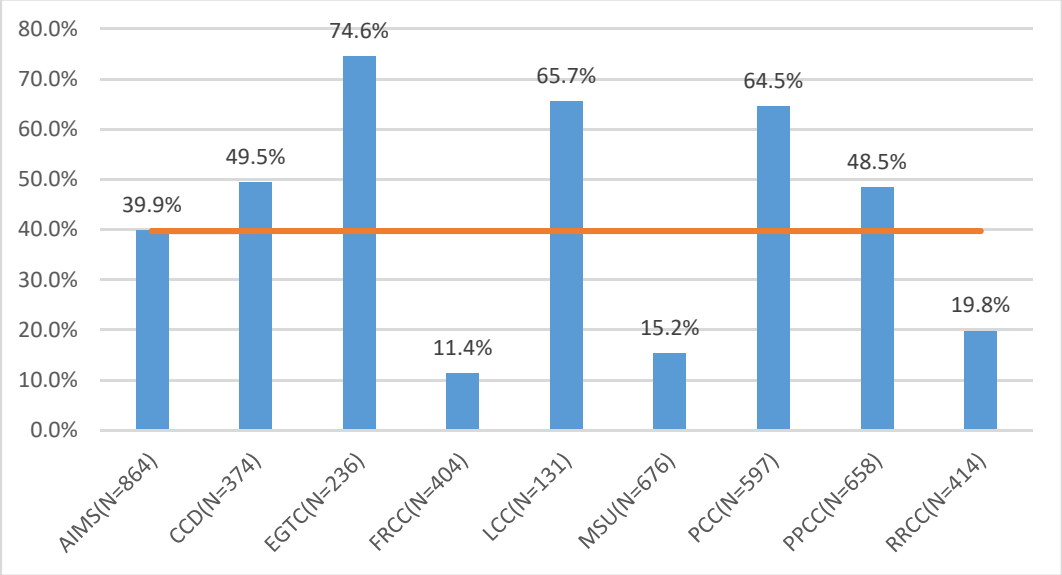
Financial aid assistance

EERC used Pell status as a proxy for a student's need for financial aid. Pell status was recorded at the point a student enrolled in a CHAMP course. Across the CHAMP consortium, 40 percent of students received some amount of Pell support. Figure 9 presents the range of Pell recipients across the colleges. At FRCC[20], only 11 percent received Pell as compared to 75 percent of CHAMP students at EGTC. It should be noted that non-credit students are not eligible for Pell, helping to explain the low percentage. LCC and PCC both reported 65 percent of students on Pell, and CCD and PPCC reported about half their CHAMP students receiving Pell. MSU and RRCC both indicated less than 20 percent of their students receiving Pell.

The proportion of Pell receivers to some extent reflect the employment rate of CHAMP enrollees. Incumbent workers in CHAMP program were, in general, less likely to receive Pell assistance while their unemployed counterparts may be more likely to receive financial support. For example, FRCC and MSU had low rates of Pell support. As we will see below under "Employment," these colleges also had large proportions of students who were incumbent workers.

[20] The low rate of Pell receivers at FRCC may be due to the large proportion of their non-credit students most of whom were employed when enrolling in CHAMP. These non-credit students were not eligible for Pell.

Figure 9. Proportion of CHAMP Students Receiving Pell by School



ACADEMIC OUTCOMES

This section reports on CHAMP students' academic outcomes. EERC focuses on three major outcomes: retention rates before earning the first credential (certificate, associate or bachelor's degree); the number and types of credentials earned; and the time elapsed until earning the first credential. We also examined the number of CHAMP students who went on to pursue a second credential after completing their first credential.

Retention/Completion

One of the important questions in this study is whether participation in CHAMP programs was associated with retention - students staying in school and continuing their studies to completion. To assess retention, EERC followed CHAMP students from their initial enrollment in a CHAMP course through the end of the study period, fall of 2016. Two populations emerged – the non-completers and completers.

The non-completers are CHAMP students who did not earn a credential or degree during the study period. Some non-completers were not retained and did not earn a credential, and some continued to be retained during the study period, but had not yet earned their first credential. Among those who stayed, some are pursuing a bachelors' degree which may take at a minimum three or four years to complete; others are students who first enrolled in a program of study late in the CHAMP grant, and have not yet earned a credential.

Completers are those students who completed a credential or degree. Some completers left school after subsequent to earning their first credential; as well as students who completed at least one credential and chose to continue their studies to accumulate further credits, stacking

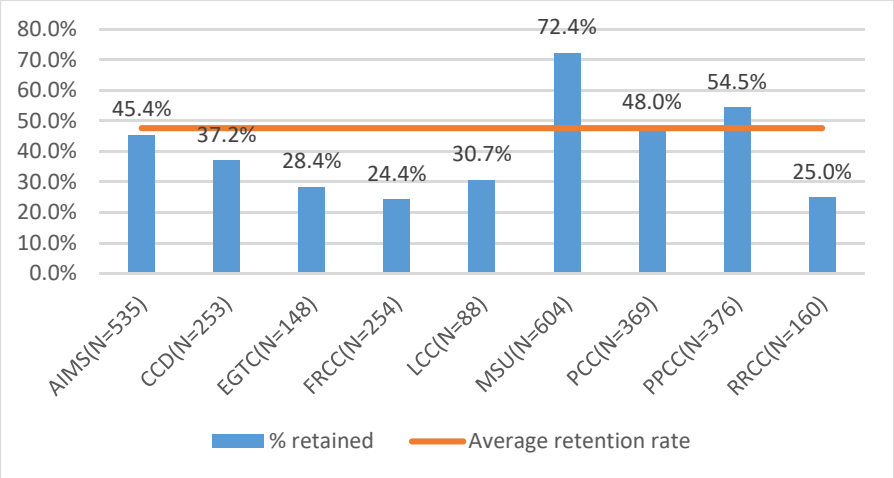
additional credentials or transferring to the four-year, CHAMP partner college, MSU or another school.

Retention Rates before Earning a First Credential

EERC found that across the consortium, a little less than half of the non-completers remained enrolled (47.3 percent). These retention rates are in line with the system average from fall 2014 to fall 2015, 49 percent. More than half of the non-completers were not retained.

Retention rates varied by CHAMP schools (Figure 10). MSU, the only four-year university in the CHAMP program, had the highest rate of student retention across CHAMP institutions. As of fall 2016, the end of the study period, 72 percent of all MSU non-completers were still registered. Of the community colleges, PPCC had the highest rate of retention, 54.5 percent; and PCC and Aims reported rates close to the consortium average of 48.0 percent and 45.4 percent respectively. Lower rates, hovering around a third of CHAMP students, were reported by LCC, EGTC, and CCD. FRCC and RRCC only had a quarter of their students continuing to register following initial enrollment, 24 percent, and 25 percent respectively.[21]

Figure 10. Retention Rate Among Non-Completers, by School



Retention/Completion Over Time

EERC also tracked students' registration from first enrollment until they earned their first credential. The longitudinal retention rate reflects how long students persist in their program of study.

[21] As a comparison, retention rates at CCCS from Fall 2014 to Fall 2015 are as follows: CCD: 40.8%, FRCC: 51.2%, LCC: 59.6%, PCC: 52.8%, PPCC: 51.1%, RRCC: 50.8%.

Table 6 presents the retention rate for each of the spring and fall CHAMP cohorts[22]. The first spring to fall retention rate, spring 2014, was 52 percent indicating 52 percent of the spring 2014 cohort re-enrolled in the program in fall 2014. For the spring 2015 cohort, however, the rate of retention was ten percentage points lower, 43 percent. The rate for the spring 2016 was just slightly lower than that of spring 2015, at 41 percent. The first fall-to-spring retention rates among the fall cohorts were better than the spring cohort. In contrast, EERC found much higher overall rates of retention for those students in fall cohorts. Over 60 percent of the starting sample were retained in the first fall-to-spring transition. At the same time, it is important to note that every cohort over time saw a decrease in enrollment for non-completers, Table 5. The fall 2016 column reflects those students who have not yet completed a credential by the end of the study period but remain enrolled, non-completers.

Table 6. Retention Rate Over Time for Non-completers

CHAMP student cohort by semester	Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016
Spring 2014 (N=823)	429 (52.1%)	351(42.6%)	229 (27.8%)	163 (19.8%)	106 (12.9%)
Fall 2014 (N=615)	--	404(65.7%)	194(31.5%)	141(22.9%)	73(11.9%)
Spring 2015 (N=610)	--	--	265(43.4%)	211(34.6%)	150(24.6%)
Fall 2015 (N=727)	--	--	--	438(60.2%)	267(36.7%)
Spring 2016 (N=644)	--	--	--	--	265(41.1%)

Retention Rates Among CHAMP Completers

In the following analysis of CHAMP *completers,* EERC again uses the spring-to-fall and fall-to-spring cohorts. Here, we look at CHAMP students who completed a program of study and earned a credential and continued to be enrolled as they pursued additional or stacked credentials such as certificates or associate degrees. Note, for those students who completed their program during a summer term, we considered their credential as of the prior spring and include them in the statistics for spring to fall retention.

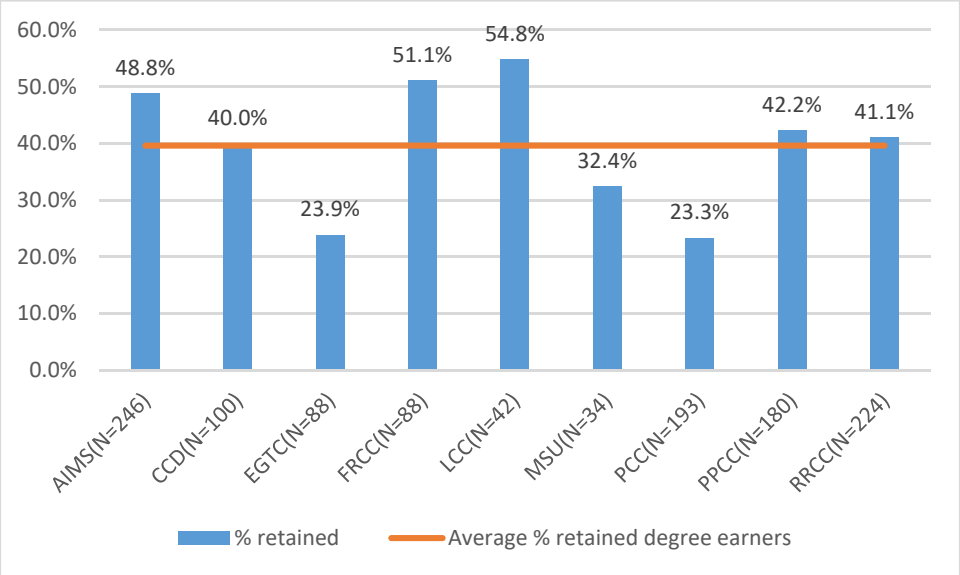
Collectively, over the three years, 1,195 CHAMP students (29.6 percent of all CHAMP students) registered for fall or spring semesters and earned one or more certificates or degrees. Differences existed between the colleges, but again, the reader should be mindful of the different credentials each college offered and thus the opportunities potentially available for students. Further, some colleges explicitly stacked their certificates towards a higher credential, e.g., LCC where student could take three welding certificates as a sequence on the way to an associate's degree.

Overall, 40 percent (473 out of 1195) of all CHAMP credential earners continued to be registered at one of the CHAMP colleges over the three years (Figure 11). CHAMP graduates from Aims, FRCC, and LCC evidenced higher than average retention rates. Fifty percent of FRCC and LCC

[22] We do not track summer cohorts as the samples are small.

completers also re-enrolled in school after earning certificates or degrees, followed by 49 percent at Aims. This likely results from the program designs at these colleges which encouraged stacked credentials. The retention rate among certificate earners at MSU was 32 percent. Retention rates at CCD, PPCC, and RRCC were at the consortium average e. At EGTC and PCC, however, the post-credential retention rate was close to 23 percent.

Figure 11. Post-credential Retention Rate Among Who Enrolled in Spring or Fall Terms, by School



To further explore the retention rate over time, EERC examined CHAMP credential earners' retention rates by spring and fall cohorts. The results are presented in Table 7. Like their counterpart non-completers, fall-to-spring retention rates were higher than that for spring-to-fall rates for the completers. The fall 2014 cohort had 77-degree earners, and 48 of them (62.3 percent) enrolled in spring 2015. Moreover, 74.9 percent of the degree earners in the fall 2015 cohort stayed enrolled in school after getting their credentials in fall 2014. In contrast, the spring to fall retention rates were much lower. This is not uncommon. Less than half of the 111-degree earners in the spring 2014 cohort continued to be enrolled in fall 2014, and only 44.6 percent of the 294 completers from the spring 2015 cohort remained registered in fall 2015. Despite a higher number of program completers (N= 311) in spring 2016 cohort than in the previous cohorts, their retention rate was only 30.5 percent, which was much lower than all other cohorts. This might be a future topic for exploration.

As expected, when EERC tracked all completers over time – we saw a steady decrease in their continued enrollment. For example, for spring 2014 for which we could track through the 5th semester, we found that of the original 111 completers, only 11 students were still registered in fall 2016, just under 10 percent. Again, we saw smaller rates of post-credential retention for the spring cohorts than for the fall cohorts. For example, half of the 111 spring 2014 credential

earners left schools in fall 2014. However, 87.3 percent (48[23] out of 55 students) were still enrolled in spring 2015.

Table 7. Retention Rates over Time for Completers

Degree Earners	Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016
Earned credentials in Spring or Summer 2014, Spring 2014 cohort (N=111)	55 (49.5%)	48 (43.2%)	27 (24.3%)	21 (18.9%)	11 (9.9%)
Earned credentials in Fall 2014, Fall 2014 cohort (N=77)		48 (62.3%)	33 (42.9%)	26 (33.8%)	9 (11.7%)
Earned credentials in Spring or Summer 2015, Spring 2015 cohort (N=294)			131 (44.6%)	94 (32.0%)	34 (11.6%)
Earned credentials in Fall 2015, Fall 2015 cohort (N=167)				125 (74.9%)	66 (52.8%)
Earned credentials in Spring or Summer 2016, Spring 2016 cohort (N=311)					95 (30.5%)

In sum, fall-to-spring retention rates were higher than that of spring-to-fall rates and rates of retention post a credential diminish over time.

Graduation

An important indicator of the success of CHAMP's training programs is the rate of student graduation – and the credentials earned. We begin the analysis with the desired academic goal CHAMP students reported at initial registration. We then examine the credentials students' earned. Note, given time censoring, EERC's analysis only looks at data up to and inclusive of fall 2016. Students who started their program of study during the latter part of the study period may not have had sufficient time to complete their credential. Thus, there may be more students who earned a credential then are reported here.

Declared Academic Goal at Time of Enrollment

Each of the CHAMP schools provided data on the declared credential of interest at the time of registration when many students indicate their academic goal or the credential(s) for which they have enrolled. There were five options for declared certificate/degree goals under CHAMP programs: short-term certificate (less than one-year programs); long-term certificate (between 1

[23] Note, some of the 48 students may not be the same as the 55 students in fall 2014, but include some credential earners from spring 2014 who dropped out of schools in fall 2014, but then re-enrolled in spring 2015. Nevertheless, the numbers still reflected the general trend that the fall-to-spring retention rate was higher than that for spring-to-fall.

to 2-year programs); associate's degree; bachelor degrees; and students not seeking any credential. Colleges also reported on the students who had not declared any academic credential when they initially enrolled. These students may not have intended to earn a credential, or simply had not yet identified a specific focus of study.

The distribution of desired credentials reported by CHAMP students is presented in Table8. Over half of all CHAMP students stated that they were pursuing associate degrees (51.9 percent). Fifteen percent of students declared a short-term certificate. Fourteen percent of the CHAMP students (all from MSU, the only four-year college in the consortium) were studying for bachelor's degrees. Only a small percent of CHAMP students (4.9 percent) declared a goal of earning a long-term certificate. Six percent of students stated they were not interested in earning any credential. Eight percent of the students failed to report any specific goal for their studies.

Table 8. Academic Goal Declared at Registration

Declared Academic Goal at the Time of Registration	# CHAMP students	% CHAMP students
Associate degree	2260	51.90%
Bachelor's degree	622	14.30%
Short-term certificate	655	15.10%
Long-term certificate	212	4.90%
Not seeking any degree	251	5.80%
Undeclared	354	8.10%
Total	4354	100.00%

Graduation rate

Overall, between spring 2014 and fall 2016, 1,290 out of 4,354 CHAMP students (29.6 percent) graduated with at least one credential – certificate or degree. This is better than the overall CCCS three-year graduation rate for fall 2012 starters graduating in 2015, which was 22 percent. However, CHAMP graduation rates have to be understood within the context of the length of time it takes for students to earn them. Thus, colleges that enrolled most students in short-term certificates were more likely to have a higher rate of graduation than MSU, a four-year college where it traditionally takes a minimum of four years to complete a bachelor's degree.

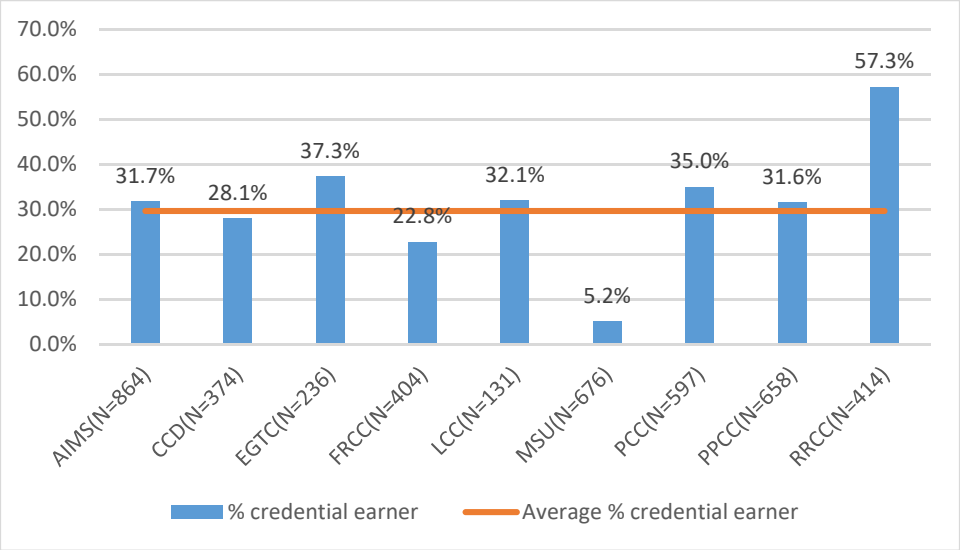
Figure 12 below presents the graduation rates for each of the 9 CHAMP colleges. RRCC had the highest graduation rate, 57 percent. This is likely a result of the systems they put into place to improve credential attainment. See later sections of this report for more information. EGTC and PCC had similar graduation rates, 37.3 percent and 35 percent respectively. The other colleges, except FRCC, evidenced a 30 percent rate of graduation rates. FRCC had the lowest graduation rate at 23 percent. This can be explained by the large percentage of CHAMP FRCC students

who were taking non-credit CHAMP courses[24] (280 of 404 students, 69 percent). It also may be a result of doing this analysis prior to the end of the spring 2017 semester.

While a significant majority of MSU students stated that they were pursuing a bachelor's degree,[25] the data used for the current report (up to fall 2016) showed no bachelor's degrees awarded. EERC analysis, however, which used spring 2017 data did in fact find that a number of MSU students earned bachelor's degrees. In respect to the data used for this report's study period, 5 percent of MSU CHAMP students (N = 35 students) had earned a short-term certificate.

The graduation rates in Figure 12 represent the proportion of students who earned at least one credential – graduating from one of the CHAMP programs. It does not provide information on the type of credential received. The details of the credentials earned by CHAMP students are presented in Table 9 below.

Figure 12. Proportion of Graduates/ Earned a Credential



Highest credential/degree

Under CHAMP the credentials offered by the colleges differed in terms of the number of credits needed and the length of the program, e.g., a short-term certificate versus a bachelor's degree. We, therefore, chose to analyze earned credentials by the highest credential a student had attained.

[24] However, 4 out of the 280 students taking non-credit courses went on to earn a credential.
[25] Five MSU students stated not interested in any degree, 49 MSU student did not declare any degree of interest. The rest of MSU CHAMP students all striving for bachelor's degrees.

Table 9 presents the highest credential earned by all CHAMP students. Most of the completers earned short-term certificate (19.1 percent) followed by associate's degree (9.3 percent). Very few of the completers earned long-term certificate (1.3 percent). The statistics suggest that, though the completion rate is low at around 30 percent, more students earned short-term credentials than long-term credentials.

Table 9. Highest Credential Earned

Highest Degree Earned	Number of Students	Proportion
Associate's degree	403	9.3%
Short-term Certificate	831	19.1%
Long-term Certificate	56	1.3%
None	3064	70.4%
Total Students	4354	100.0%

As reflected in the relatively low graduation rates across the CHAMP consortium (30.6 percent), it is clear that many students did not complete their desired credential either because they dropped out or because time censoring precluded earning a credential during the study period. Further, some students earned a credential, but not the one they had initially declared. And some students who had not declared their intentions at the time of first enrollment, went on to earn a certificate or degree. We, therefore, compared the highest degree achieved with the credential students originally stated was their goal (Figure 13)[26]. We focus on CHAMP students who declared an associate's degree, a long-term certificate, a short-term certificate, and those who did not declare a specific credential.

We begin with the CHAMP students who stated that they had enrolled to earn an associate's degree. Of the 2,260 CHAMP students who had identified the goal of an AS/AA, only 16 percent earned one within the study period.[27] A larger proportion of these students earned short-term certificates (19.0 percent). Some programs, such as the welding program at LCC, use a series of certificates to build towards the associate's degree. But it is not clear to what extent students were using such scaffolding or consciously stacking their credentials along the way to an associate's degree or chose only to pursue a short-term certificate. Note, 1.3 percent of this pool of associate's degree seekers, earned a long-term certificate.

[26] CHAMP students pursuing bachelor degrees (N = 622. All from MSU) are excluded in this figure as none of them had earned a bachelor's degree and there was not any variation in the credentials received. The only credential earned by this group was short-term certificate (N= 28, 4.5 percent). CHAMP students who declared not seeking any credentials were also excluded in this figure (N= 251) as 98.4 percent of them did not earn any credential. Thus, Figure 13 presents the highest credential received for 3,480 CHAMP students.

[27] For the state of Colorado's public two year colleges in 2013 the completion rate within three years of entrance is 20.8%. See http://collegecompletion.chronicle.com/state/#state=CO&sector=public_two

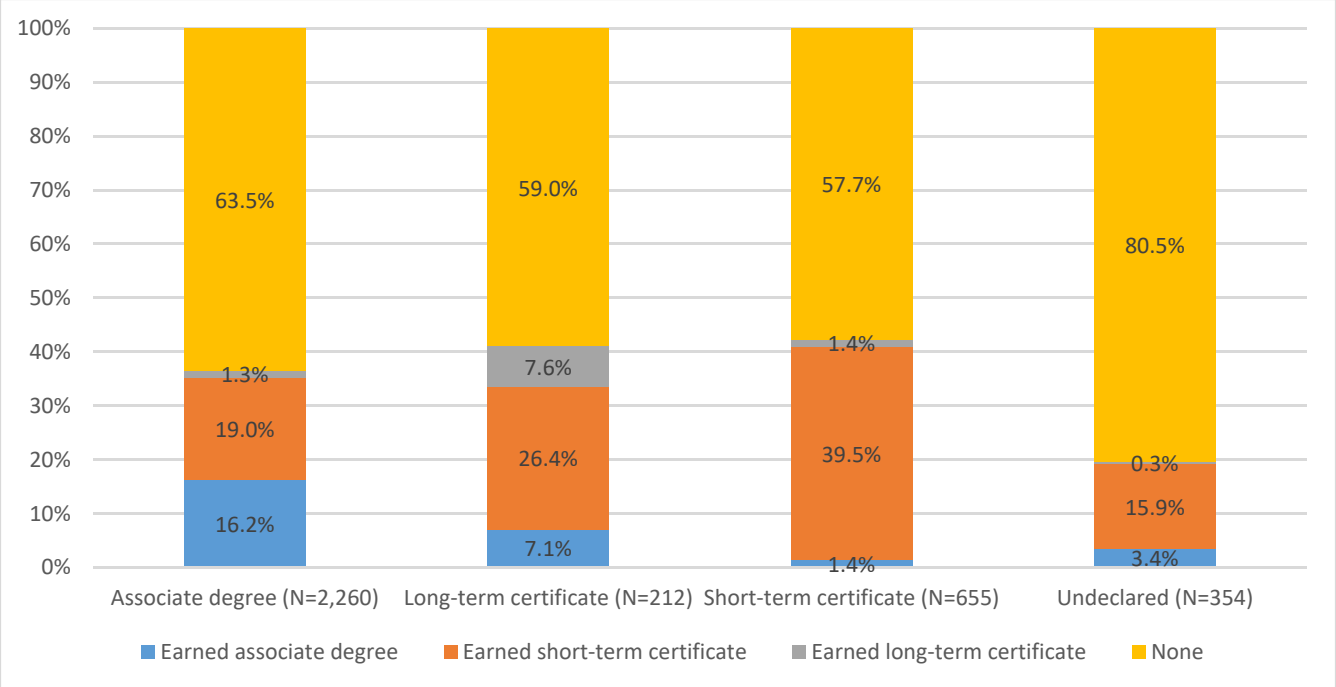
Among the students who wanted to earn a long-term certificate, 8 percent were successful. A larger percent of these students, 26.4 percent, however, earned a short-term degree. At the same time, seven percent of this same group of students exceeded their initial goal by earning an associate's degree.

Students pursuing short-term certificates had the highest rate of success earning the credential they set out to earn (39.5 percent). Some short-term certificate seekers, earned a long-term certificate (1.4 percent) and 1.4 percent also earned an associate's degree.

Just under 16 percent of students who had not indicated a target credential earned a short-term certificate; 0.3 percent earned a long-term certificate; and 3.4 percent earned an associate's degree.

Overall, when we look at the rate of completion – with at least one earned credential, the students who enrolled for short and long-term certificates had the best rates of completion, 42.3 percent, and 41 percent respectively. Students who initially declared an associate's degree as their goal had a 36.5 percent rate of completion. Interestingly, the students who had not declared a goal had the lowest rate of completion, only 19.5 percent. This suggests the importance of helping identify and setting academic goals for themselves as a motivator.

Figure 13. Earned Certificate/Degree by the Declared Target Credential



Next, we examine whether graduation rates varied conditional on students' demographic characteristics, registration status, financial assistantship, and military background. Again, the reader should be mindful that some of the student characteristics intersect with one another –

the student populations varied by college as did the credentials they could earn. Thus, no causal associations should be interpreted from the presented demographic data.

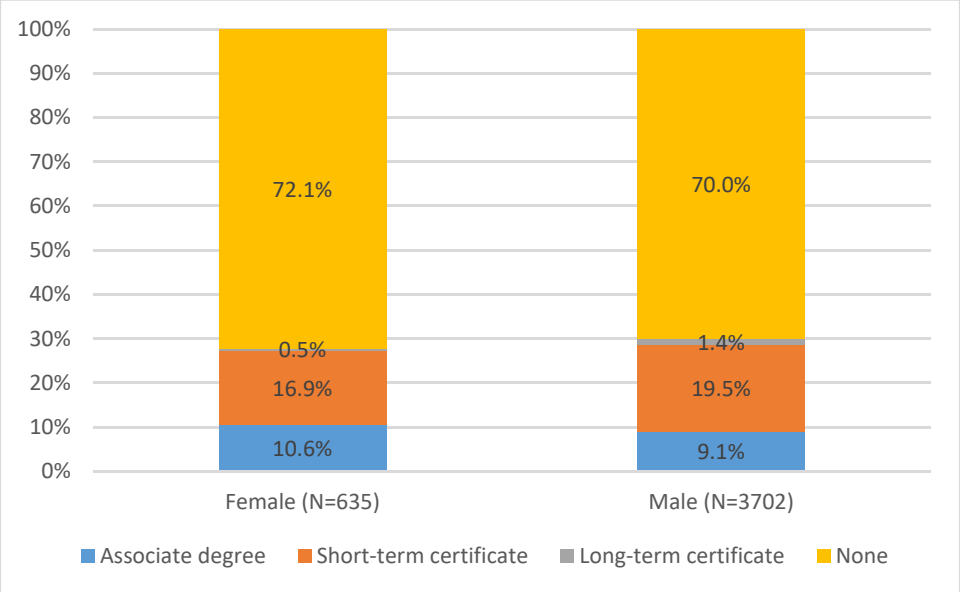
Graduation rate and demographics

By Gender

Thirty percent of male CHAMP students and 28 percent of female CHAMP students earned a certificate or degree during the study period.

When EERC examined graduation rates by the type of credential earned (Figure 14), we found that 11 percent of female students earned associate degrees compared to 9 percent of male students; and 20 percent of male CHAMP students earned short-term certificates compared to 17 percent of female students. EERC also found that 1.4 percent of male students earned a long-term certificate but only .5 percent of female students.

Figure 14. Proportion of Credential Earned by Male and Female Students



By Race/ethnicity

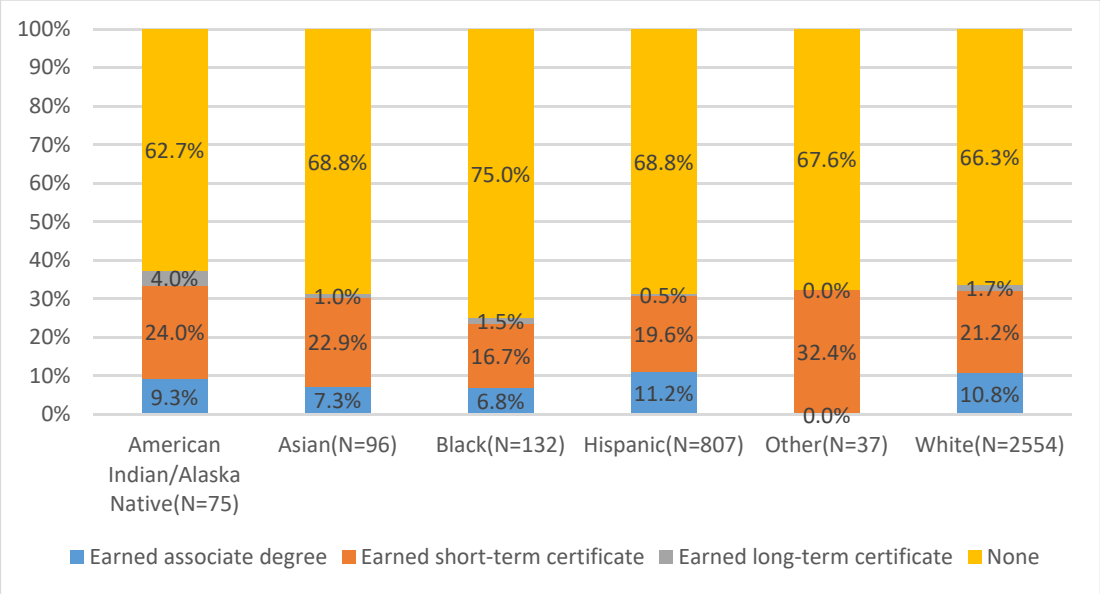
Graduation rates did not vary much by race/ethnicity except for American Indian/Native Alaskan and black CHAMP students (Figure 15). While the number of American Indian/Alaska native students was small at 75, this group had the highest rate of graduation at 37 percent. White students had the next highest rate of graduation 34 percent, followed by students from other racial/ethnic groups (32.4 percent). Asian and Hispanic students had the same graduation rate, 31 percent. Black CHAMP students had the lowest rates of graduation, 25 percent.

When we look at the graduation rates by type of credential, we find that regardless of racial background, the highest credential earned by all racial/ethnic groups was a short-term certificate. In fact, students reporting "other racial group" only earned short-term certificates, 32.4 percent. American Indian/Alaska native students had the next highest rate of short-term certificates, 24.6 percent, followed by Asian and white students earning short-term certificates, 22.9 and 21.2 percent respectively. Hispanic students earned short-term certificates at a rate of 19.6 percent. Blacks had the lowest rate of earning short-term certificates, 16.7 percent.

Eleven percent of Hispanic and 10.8 percent of white students received an associate degree. Nine percent of American Indian/Alaskan natives CHAMP students earned an associate's degree; and 7 percent of Asian and black CHAMP students.

Four percent of the American Indian /Alaskan Natives earned long-term certificates as did 2 percent of white students. Very few Asian, black, and Hispanic students earned long-term certificates as their highest credential.

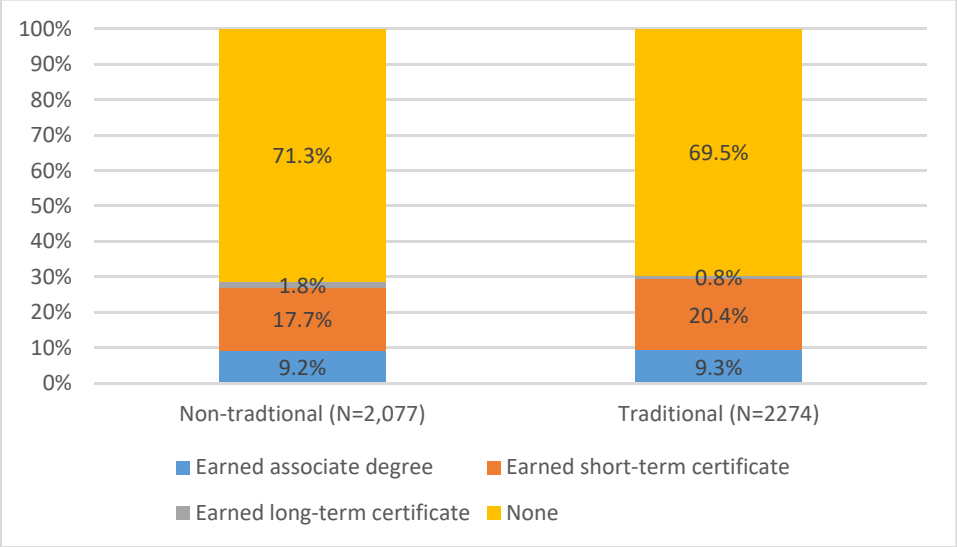
Figure 15. Highest Credential Earned by Race/Ethnicity



By Age

The difference in graduation rates between students of non-traditional age and their counterpart traditional-age students was small (Figure 16). About 31 percent of the traditional age CHAMP students earned a credential while the rate was 29 percent for non-traditional students. Among the traditional age degree earners, 20 percent earned short-term certificates, as compared to 18 percent of non-traditional students. The graduation rates for associate's degree earners in both groups was almost identical at 9.2 percent and 9.3 percent. Finally, while the percentages are small, non-traditional students were more likely than traditional students to earn long-term certificates, 1.8 percent compared to 0.8 percent.

Figure 16. Graduation Rates by Age (Traditional and Non-Traditional Students)

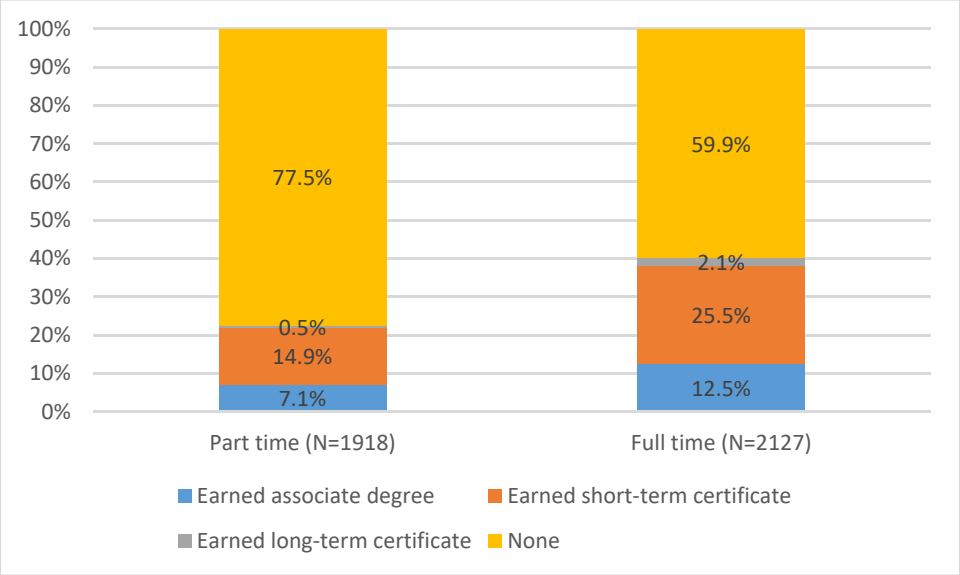


By Registration Status

Graduation rates for full-time CHAMP students were 17 percentage points higher than those of part-time CHAMP students (Figure 17) for all credentials (40 percent for full-time students compared to 23 percent for part-time students). For each of the three credentials of interest – associate's degree, long-term certificate and short-term certificate, full-time students had almost double the rates of graduation as compared to their part-time counterparts.

The largest percentage difference in graduation rates was between full and part-time students who completed a short-term certificate (25.5 percent vs. 14.9 percent). On the other hand, there was only a five percentage points difference between full and part-time students who earned an associate's degree, 12.5 percent vs. 7.1 percent; and less than a two percent difference for students earning long-term certificates, 2.1 percent, and 0.5 percent. These findings are not too surprising given that full times students earned more credits and are more likely to complete their studies in a shorter amount of time than their part-time counterparts.

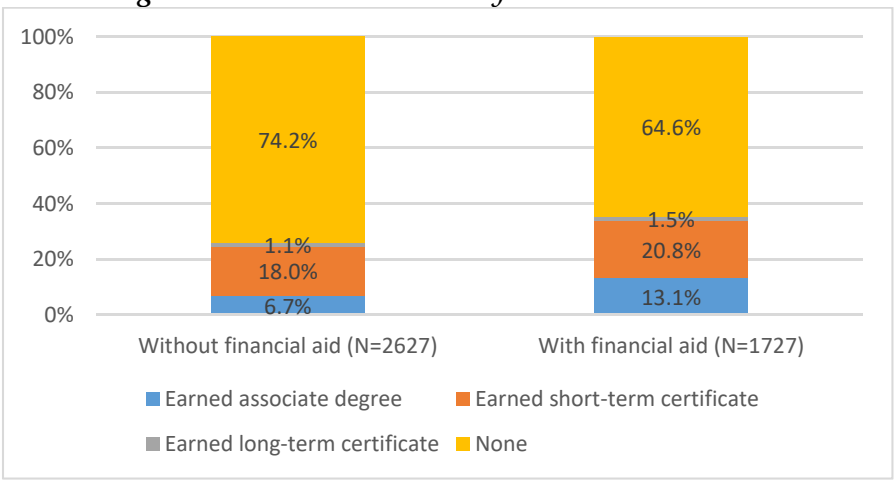
Figure 17. Graduation Rates by Registration Status



By Financial Aid Status

Figure 18 shows the proportions of students earning the three types of credentials in CHAMP by student's financial aid status, receiving a Pell grant. Students with financial aid graduated at higher rates than CHAMP students without financial aid 35.4 percent vs. 25.8 percent. The major difference in graduation rates lies in the proportion of students earning associate degrees. The associate's degree graduation rate among students with financial aid was almost twice as high as the rate for students without financial aid. Students with financial aid also had a two percentage point higher completion rate for short-term certificates than students without financial aid. It is not clear how many of students without financial aid were balancing work and their studies. This would be an important area for future exploration.

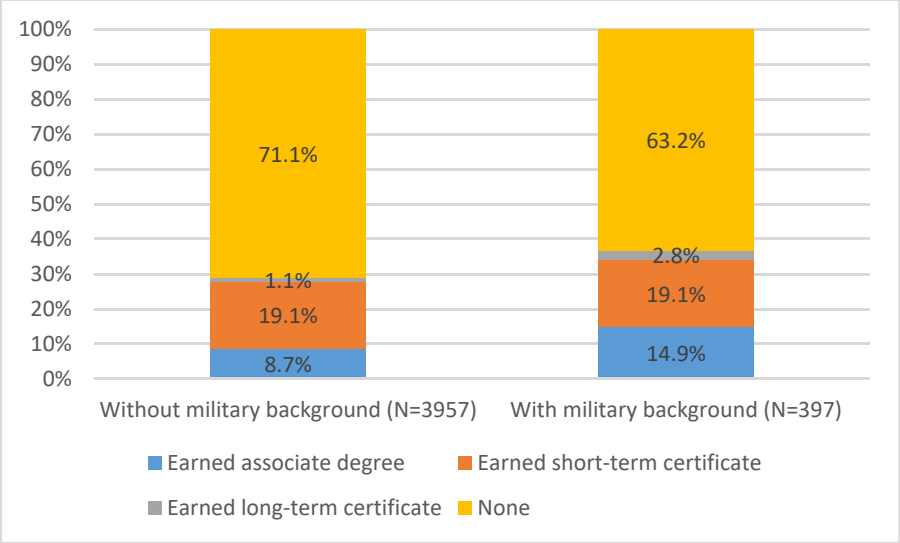
Figure 18. Graduation Rate by Financial Aid Status



By Military Background

A higher proportion of CHAMP students with a military background graduated and earned credentials than students without a military background, 37 percent versus 29 percent (Figure 19). Fifteen percent of students with military experiences earned short-term certificates as compared to 9 percent without a military background. The proportion of students completing short-term certificates in both groups was the same. Few students received long-term certificates, but here the difference was 1.7 percent. Those with military background earned long-term certificates at a rate of 2.8 percent versus 1.1 percent for those without a military background.

Figure 19. Graduation Rate by Military Background



In summary, regardless of credential earned, full-time versus part-time student status appears to be strongly associated with rates of graduation, a 17.6 percent difference. No doubt the ability of students to complete more credits each term facilitates faster completion, however, what other factors come into play; and the nature and synergy of these factors require further investigation.

Financial aid and military background also seems to be related with completing credentials, but far less at 9.6 and 7.9 percent respectively. Being a black student or being an American Indian/Alaska Native student also seems to be associated with student rates of graduation, 37.3 percent of American Indian/Alaskan Native graduating compared to only 25 percent of black students. Age and gender did not appear to be factors that influenced graduation rates.

Time to graduation

In this section, we address the question of how many semesters it took for a student to complete his/her first CHAMP certificate or degree. EERC only considered the number of fall and spring semesters between students' first enrollment in CHAMP and completing their first CHAMP

credential[28]. Note, if a student earned a short-term certificate in the same semester she/he first registered, that student would be considered as taking one semester to complete a CHAMP program. The results are presented in Table 10 below.

Most CHAMP credential earners completed their program of study – a short-term certificate – in the same semester in which they first registered for CHAMP, 39.4 percent. About 60 percent of all CHAMP completers earned their first credentials within two semesters of enrolling in CHAMP. Moreover, over 90 percent of credential earners finished the program in six semesters or three academic years[29]. These statistics are consistent with EERC's above findings that 83.7 percent[30] (Table 10 below) of CHAMP credential earners received a short-term certificate.

Table 10. Number of Fall and Spring Semester to First Credential

Number of semesters to first credential	Frequency	Percent
1	508	39.4%
2	261	20.2%
3	166	12.9%
4	125	9.7%
5	64	5.0%
6	72	5.6%
7	48	3.7%
8	14	1.1%
9	32	2.5%
Total	1290	100%

Stacking credentials

One of the goals of the CHAMP grant was to create career pathways in advanced manufacturing through the students' accumulation of multiple credentials – or *stacking*. As discussed above, during the grant period, CHAMP students received three types of credentials – short-term certificate, long-term certificate, and associate degrees. Some students earned several certificates, while others earned both certificates and an associate's degree. There were

[28] EGTC follows an 8-month academic calendar rule. Therefore, their spring semester lasts until July. They did not provide registration data for their summer sessions.

[29] The number of semesters to degree also considers the time lapse between first enrollment to first degree. If a student failed to register for courses in any of the semesters in between first enrollment and graduation, EERC still counted the semesters of non-enrollment.

[30]Among the 1,290 credential earners, 64.4 percent earned short-term certificate only, 3.4 percent earned short-term and long-term certificate, 11.6 percent earned short-term and associate degree(s), and 4.3 percent received short-term, long-term certificate and associate degree.

even some students who earned more than one associate's degree during the time of study. Here we take a closer look at how CHAMP students stacked their credentials during the study period.

Between spring 2014 and fall 2016, 1,290 CHAMP students completed a program and earned at least one credential. A large majority of CHAMP students, 80 percent, earned a single type of credential. For instance, 64 percent of all credential earners earned one or more short-term certificate(s), but no other credential.[31] Fifteen percent of all credential earners received one or more associate degree(s).[32] Very few (only 12 CHAMP students) earned a long-term certificate, and none of these students earned more than one long-term certificate.

Twenty percent of all graduates (N=253) earned multiple types of credentials. Of these students, 3.4 percent (N=44) earned both a short-term certificate and a long-term certificate. A larger number of students earned both a short-term certificate and an associate's degree, 11.6 percent (N=159).). Four CHAMP students earned a long-term certificate and an associate's degree (0.3 percent). And 55 students earned all three credentials (4.3 percent).

Table 11. Type of Credentials Earned by CHAMP Students Including Stacking

Credential(s) earned	**N**	**%**
Short-term certificate(s) only	831	64.4%
Long-term certificate(s) only	12	0.9%
Associate degree(s) only	194	15.0%
Short-term and long-term certificates	44	3.4%
Short-term certificate(s) and associate degree(s)	150	11.6%
Long-term certificate and associate degree(s)	4	0.3%
Short-term, long-term certificate, and associate degree(s)	55	4.3%
Total students with credential/degree	1290	100.0%

To better understand stacking and variations across the colleges, we next analyze the number of credentials earned by school and by credential type. In reviewing the following sections, it is important to note that not all colleges offered all credentials and some colleges launched their credentials sequentially, so not all students may have had access to them or time within the study period to complete additional credentials.

[31] Some of them received multiple short-term certificates as shown in Table 12.

[32] Some students earned multiple associate degrees.

Short-term certificate only earners

A large number of students earned only short-term certificates, (831 out of 1290 graduates, 64.4 percent). Table 13 presents the distribution of these students by college. All EGTC and MSU credential earners received short-term certificates. The majority of RRCC students, 90.3 percent only earned short-term certificates. Compared with other schools, a lower proportion of PCC credential earners earned only a short-term certificate (45.5 percent).

Table 12. Degree Earners: Short-Term Certificate Only by School

Champ School	Total N of Degree Earners at College	N Earning Short-term Certificate Only	% Earning Short-term Certificate Only
AIMS	274	145	52.9%
CCD	105	63	60.0%
EGTC	88	88	100.0%
FRCC	92	54	58.7%
LCC	42	28	66.7%
MSU	35	35	100.0%
PCC	209	95	45.5%
PPCC	208	109	52.4%
RRCC	237	214	90.3%
Total	1290	831	64.4%

When EERC examined the number of certificates earned by students, we found a large number of students earned more than one short-term certificate. In fact, across the CHAMP consortium, 36 percent of students earned multiple short-term certificates (Table 12). Almost half of these multiple short-term certificate earners received two certificates, and quite a few earned up to 3 or 4 short-term certificates. Impressively, one student at Aims, earned 8.

By college there were variations. CHAMP students at LCC, PPCC, and RRCC completed significantly more multiple short-term certificate than at the other colleges. Over half of the students earning only short-term certificate at LCC and PPCC earned more than one. Moreover, 47 percent of students earning only short-term certificate at RRCC earned more than one such credential. Students at Aims and FRCC earned slightly more than the average of multiple short-term certificates, 39.3 percent and 37.0 percent respectively. However, few students at CCD, EGTC, MSU, and PCC earned more than one short-term certificate (Table 13).

Table 13. Stacking Degrees: Short-Term Certificates Only

CHAMP School	Short-Term Certificate Earners								Total N Earning Short-Term Certificates	N Earning >1 short-term certificates	% Of Short-Term Certificate Earners With >1 Short-Term Certificates
	Single short-term certificate	Dual short-term certificates	3 short-term certificates	4 short-term certificates	5 short-term certificates	6 short-term certificates	7 short-term certificates	8 short-term certificates			
AIMS	88	13	8	17	2	16		1	145	57	39.3%
CCD	46	10	6	1		-	-	-	63	17	27.0%
EGTC	79	9	-	-			-	-	88	9	10.2%
FRCC	34	19	1	-			-	-	54	20	37.0%
LCC	12	9	7	-			-	-	28	16	57.1%
MSU	25	10	-	-			-	-	35	10	28.6%
PCC	82	4	6	1		2		-	95	13	13.7%
PPCC	50	19	27	13		-	-	-	109	59	54.1%
RRCC	113	52	19	17	2	10	1	0	214	101	47.2%
Total	529	145	74	49	4	28	1	1	831	302	36%

In sum, the majority, 64.4 percent, of CHAMP credential completers earned only short-term certificates. However, among these students, 36 percent earned multiple short-term certificates.

Associate's degree earners[33]

EGTC and MSU were two CHAMP colleges which did not offer associate's degrees. However, at the seven CHAMP colleges that offer associate's degrees, ERRC found wide variations in the percent of students earning them. Out of a total of 1,167 degree earners at these seven schools 35 percent (N = 403) earned an associate's degree (Table 14). RRC reported the lowest percent number of associate's degrees earned (9 percent); and PCC had the highest, 53 percent. Other colleges with high proportions of associate's degree earners were Aims (47.1 percent), and PPCC, 40.9 percent. Less than 10 percent of degree earners earned associate degrees at FRCC (a college that offered many non-credit courses) and RRCC.

Table 14. Associate's Degree Earners by School

CHAMP School	N Earning Associate's Degree	Total N of Credential Earners	% Earning Associate's Degree
AIMS	129	274	47.1%
CCD	35	105	33.3%
FRCC	9	92	9.8%
LCC	12	42	28.6%
PCC	111	209	53.1%
PPCC	85	208	40.9%
RRCC	22	237	9.3%
Total	403	1167	34.5%

Over half (54.8 percent) of CHAMP students who earned an associate's degree also earned a short and/or long-term certificates, and a few even earned a second associate's degree. The distribution of stacking degrees at each CHAMP school is presented in Table 14.

[33] Students in EGTC and MSU only earned short-term certificates. they are, therefore, not included in this part of analysis.

Table 15. Stacking Credentials by CHAMP Students Earning Associate Degrees

CHAMP School	1 Associate Degree Only	1 Associate's Degree and Short-term Certificate				1 Associate's Degree and Long-term Certificate	1 Associate's Degree and Short-term and 1 Long-term Certificate	N with > 1 Associate's Degrees	Total Earning an Associate's Degree	N Earning an Associate's Degree Plus Additional Credential(s)	% Students Earned > 1 Associate 's Degree
		+ 1 short-Term Certificate	+ 2 Short-Term Certificates	+ 3 Short-Term Certificates	>= 4 Short-Term Certificates						
AIMS	56	18	13	6	26			10	129	73	56.6%
CCD	10	7		2	0	1	15		35	25	71.4%
FRCC	3	1	2		0	1	1	1	9	6	66.7%
LCC	6	1	3	1	0			1	12	6	50.0%
PCC	77	17	4	4	4			5	111	34	30.6%
PPCC	24	7	3	3	5	2	33	8	85	61	71.8%
RRCC	6		3	1	10		1	1	22	16	72.7%
Total	182	51	28	17	45	4	50	26	403	221	54.8%

Looking across the CHAMP consortium at students earning an associate's degree plus additional credentials, five out of seven community colleges had higher than the consortium average (54.8 percent). For example, over 70 percent of associate's degree earners at CCD, PPCC, and RRCC earned an associate's degree and at least one other credential. The high proportion of students at these colleges suggest that many of the CHAMP degree earners may have stacked certificates on their way to earning an associate's degree. The two colleges with a lower proportions of stacking associate plus another credential were LCC (50 percent) and PCC (30.6 percent).

EMPLOYMENT OUTCOMES

A major goal of the CHAMP project was to train incumbent workers and job seekers to better meet the needs of employers in advanced manufacturing. This section explores to what extent the redesign and creation of CHAMP courses and programs resulted in changes in employment status. EERC considered employment status in three ways: employment at program entry (*incumbent worker status*); employment after graduating from a CHAMP program (*non-incumbent employment*); and over the course of the CHAMP program an increase in wages for *incumbent workers.*

Given that CHAMP students did not self-report their employment status at the time of first enrollment in a CHAMP course, EERC used the Unemployment Insurance (UI) dataset as a proxy for employment status.[34] The UI dataset documents individuals' wages on a quarterly basis. For this report, we consider a student *employed* if he or she had over $1,000 income in the year-quarter of interest. Therefore, for this analysis, if all students had wage income in the year-quarter of enrollment regardless if he/she ultimately earned a credential, he or she was considered an incumbent worker. If the student earned $1000 or more in the year-quarter after graduation earning his or her first credential, we consider the student employed. If an incumbent worker experienced a wage increase of over $500 between the time of first enrollment and the end of the study period, we deemed the worker had a wage increase. This later group includes both those with and without an earned credential.

UI files include wage data up to the last quarter of 2016. EERC, therefore, was unable to identify current employment conditions for those students who earned their first certificate or associate's degree in fall 2016. As a result, the following employment rate for CHAMP students is underestimated. Moreover, employment status is only considered for credential earners. CHAMP students who started the program early in 2014 or 2015 had a higher probability of getting employed than those who started late in 2016 as the late enrollees may not have completed their programs. Finally, the observational time of wage increase for incumbent workers varies by the amount of time EERC could track them. Thus, students who enrolled in spring 2014 could be followed for three years while their counterparts who enrolled in fall 2016

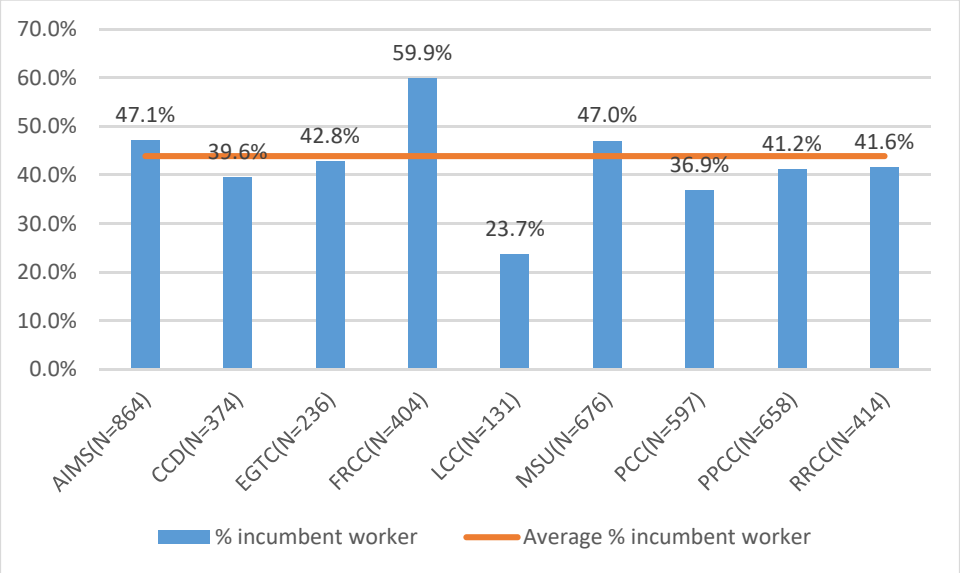
[34] EERC was able to obtain this dataset through a special contract with the Colorado Department of Labor.

only have wage data for two-quarters, i.e., third and fourth quarters of 2016. In sum, this section only provides a glimpse of the employment experience of CHAMP students, and the statistics may underestimate the impact of CHAMP on employment and wages.

Incumbent workers

Figure 20 presents all CHAMP enrollees' employment status at the time of their initial enrollment in a CHAMP course. Across the CHAMP consortium, 44 percent of students were employed - incumbent workers (N = 1910). The proportion of incumbent workers in CHAMP programs varied by college, ranging from 24 percent at LCC to 60 percent at FRCC[35]. AIMS, FRCC, and MSU had higher-than-average proportions of incumbent workers, around 47 percent. At the same time, CCD, EGTC, PPCC, and RRCC all had slightly lower than average proportions of incumbent workers, 40 to 43 percent of their respective CHAMP students. PCC had the second lowest proportion of incumbent workers, about 37 percent, across CHAMP institutions.

Figure 20. Proportion of Incumbent Workers by School



Employment upon graduation by the first credential received

The employment rate is calculated for non-incumbent students who earned a credential. We examine whether a student was able to find employment in the quarter following the year-quarter in which they earned their first credential.

EERC found that about a third (30 percent) of the 773 students who were not employed at time of initial enrollment were employed in the first quarter after they earned their first CHAMP

[35] The higher proportion of incumbent workers in FRCC than in other schools may be due to the large number of students taking non-credit CHAMP courses, most of who were employees.

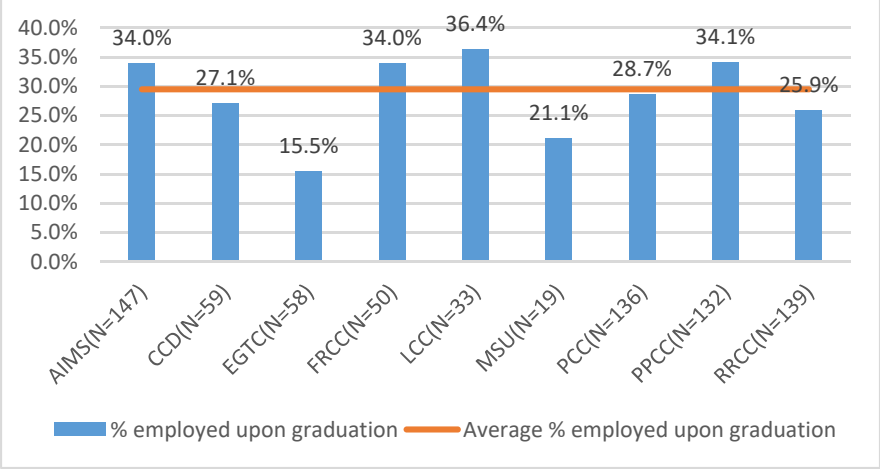
credential (N=228). When we look at the employment rate by the type of first credential earned, those receiving long-term certificate had the highest employment rate, 40 percent (12 students out of 20 long-term certificate earners). Thirty percent of the short-term certificate earners were employed in the year-quarter after receiving the credential, and about 26 percent of those with an associate's degree were employed immediately after earning their degree (Table 16).

Table 16. Employment in First Quarter After Earning First Credential

First Credential Type	Unemployed		Employed		Total
	N	%	N	%	N
Associate's degree	128	74.4%	44	25.6%	172
Short-term Certificate	405	69.7%	176	30.3%	581
Long-term Certificate	12	60.0%	8	40.0%	20

EERC then looked at differences in rates of employment of non-incumbent students by college (Figure 21). With the exceptions of CCD, RRCC, and EGTC, CHAMP institutions had over 34 percent of students employed upon earning their first certificate or degree. In contrast, CCD and RRCC had just over 25 percent of non-incumbent credential earners successfully employed upon graduation; EGTC had just over a 15 percent rate of employment.

Figure 21. Proportion Employed upon Graduation by School



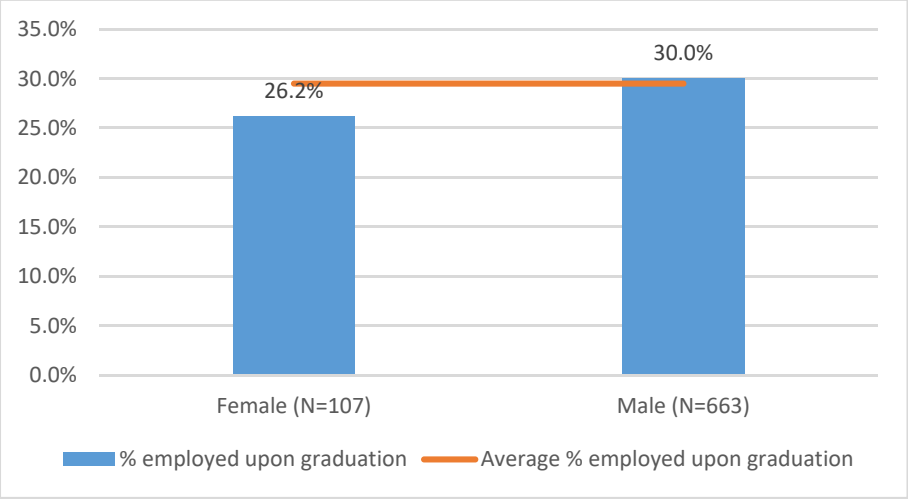
In the following sections, we examine whether the employment rate differed by CHAMP students' demographics, registration status, or military background.

By Gender

As indicated above, there were far fewer female CHAMP students who enrolled in CHAMP programs. However, graduation rates did not differ by gender (28 percent for female and 30

percent for male. See Figure 14). Regarding employment rates after completing their first credential, females had a slightly lower rate of employment than their male counterparts, 26.2 percent of females, and 30 percent of males (Figure 22).

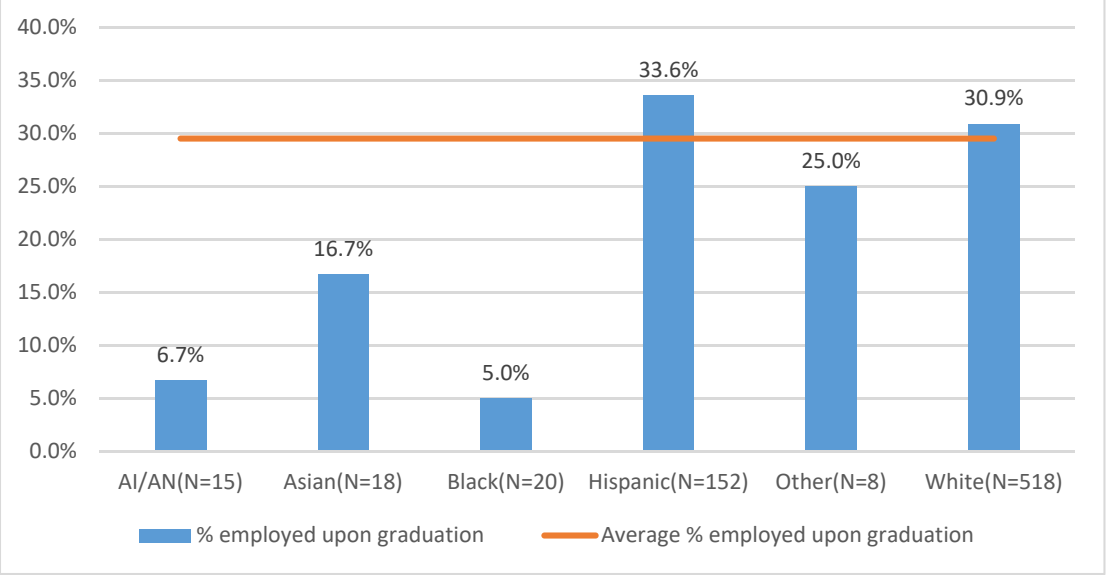
Figure 22. Employment Rate Among CHAMP Students by Gender



By Race/ethnicity

Of the students who reported their race/ethnicity, white and Hispanic students had higher than average rates of employment rates (over 30 percent. The employment rate among the black and American Indian/Alaskan native students were low at 5 and 7 percent respectively. Asian students also had low employment rates at 17 percent (Figure 23).

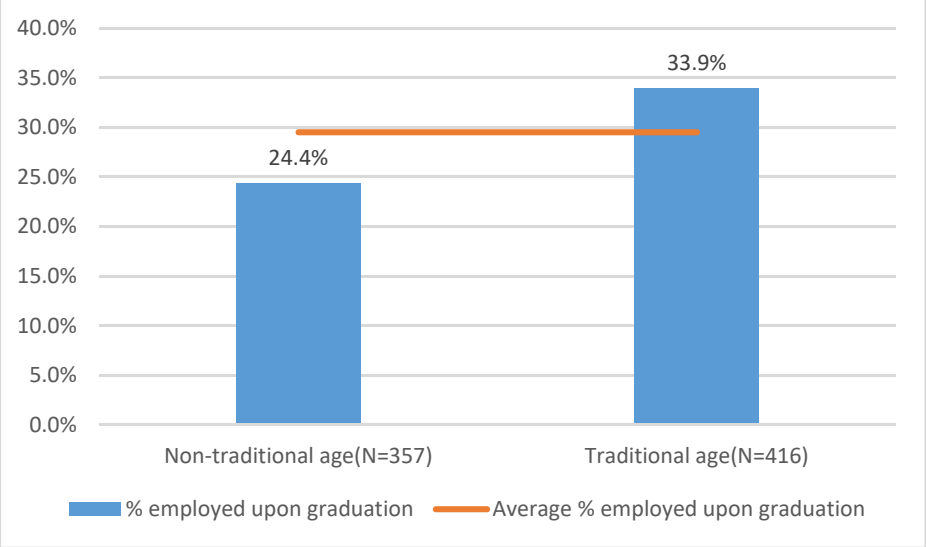
Figure 23. Proportion of Employed Upon Graduation by Race/ethnicity



By Age

Figure 24 looks at the rate of employment after completing a first CHAMP credential by age - traditional age student or non-traditional. Traditional students had a 10 percent higher rate of employment than their non-traditional counterparts (34 percent for traditional students compared to 24 percent for non-traditional students). This difference of 10 percentage points suggests that age may be associated with the probability of employment among the CHAMP sample.

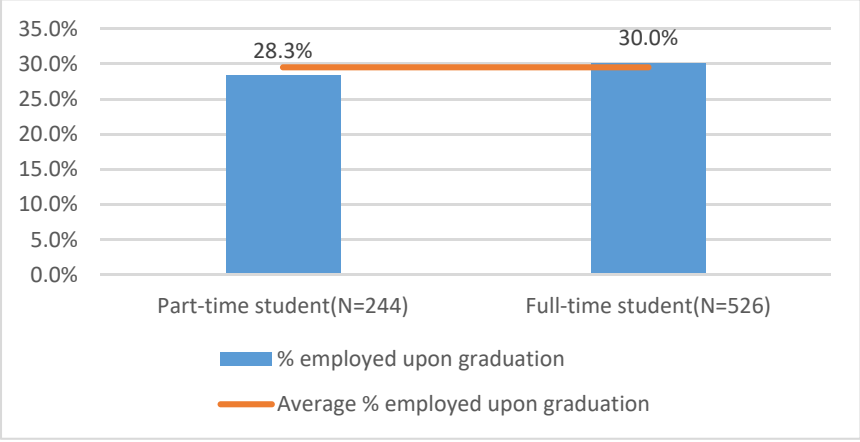
Figure 24. Proportion of CHAMP Students Employed Upon Graduation by Student Status



By Registration Status

Regarding employment, there was no real difference between students who had been full or part-time when they received their first certificate or degree, Figure 25. Full-time students' employment rate was just one percentage point higher than their part-time counterparts.

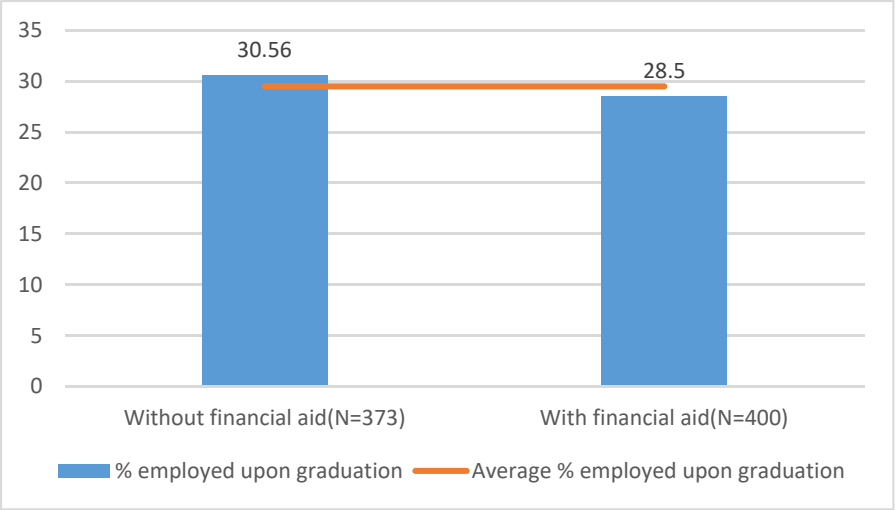
Figure 25. Proportion of CHAMP Students Employed Upon Graduation by Registration Status



By financial aid status

Employment rates among students with or without financial aid were similar. The employment rate of students without any Pell grant was only one percentage point higher than for students who had received a Pell grant (Figure 26).

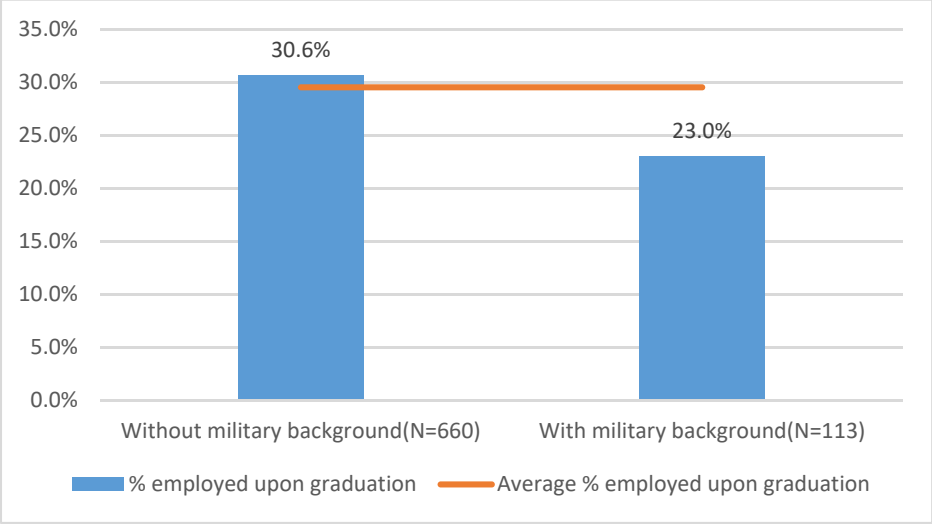
Figure 26. Proportion of CHAMP Students Employed Upon Graduation by Financial Aid Status



By Military background

The employment rate after earning a first credential was higher for students without a military background than their counterparts with a military background (30.6 percent compared to 23.0 percent. Figure 27). The employment rate of degree earners among students with a military background was seven percentage points lower than the consortium average employment, 30 percent.

Figure 27. Employment Rate Upon First Credential by Military Background



In sum, employment rates stratified by students' demographic characteristics suggest that some demographic characteristics may be associated with the rate by which credential earners were employed. For example, traditional-age students had higher employment than non-traditional students. Moreover, white and Hispanic students were far more likely to be employed after graduation than black and American Indian/Alaskan native students. Also, students with military experience were less likely to be employed after graduation than students without military background. Further investigation is needed to see if these initial patterns hold up over time and what factors and how they interact, affect rates of employment post credential.

Wage Increase

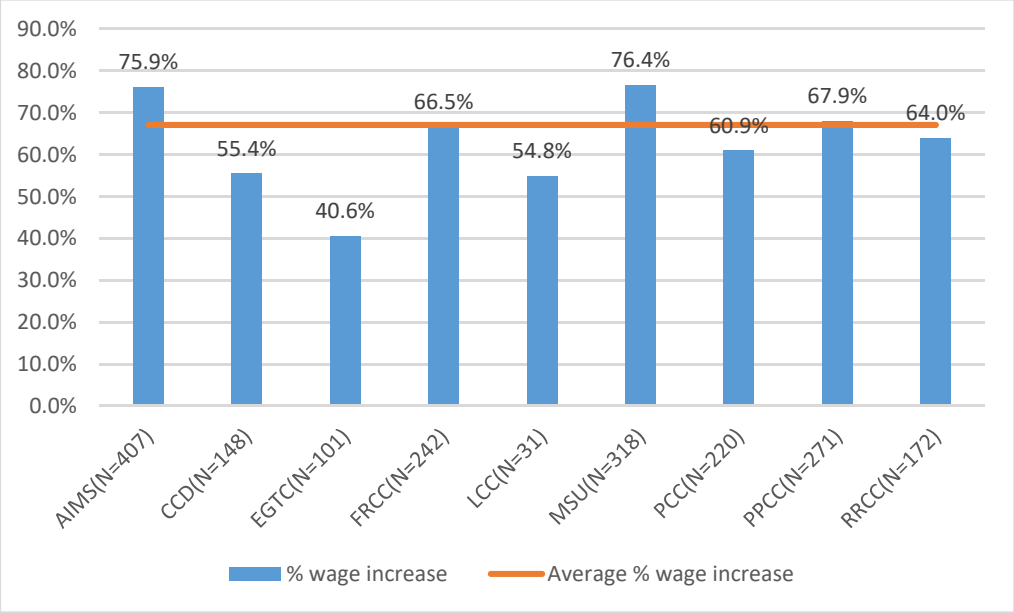
EERC next examined whether CHAMP students who were incumbent workers experienced an increase in earnings over $500 since enrolling in CHAMP program. This analysis focuses on whether learning new technologies and skills through CHAMP helped these students find better jobs with a higher income. This analyses includes both incumbent worker enrollees who earned a credential and those who had not.

When we look at wage increases among all CHAMP students who were employed when enrolling in CHAMP programs, we find that 67.1 percent of them experienced a wage increase of over $500 in quarterly wages. In the following sections, we examine the growth in wages by students' demographic characteristics, registration status, financial aid conditions, and military background. In each of these analyses, the average proportion of students who had a wage gain may differ slightly from the mean of the entire consortium. The mean applies only to the number of students for whom we have data, and that varied due to missing data.

By school

Incumbent workers at CHAMP institutions differed in the rate at which they received a pay increase). The rate ranges from 41 percent at EGTC to 76 percent at Aims and MSU. At FRCC, PPCC, and RRCC the proportion of CHAMP students with an increase in wages was close to the consortium mean of around 66 percent. Students at CCD and LCC had a lower wage increase, about 55 percent (Figure 28).

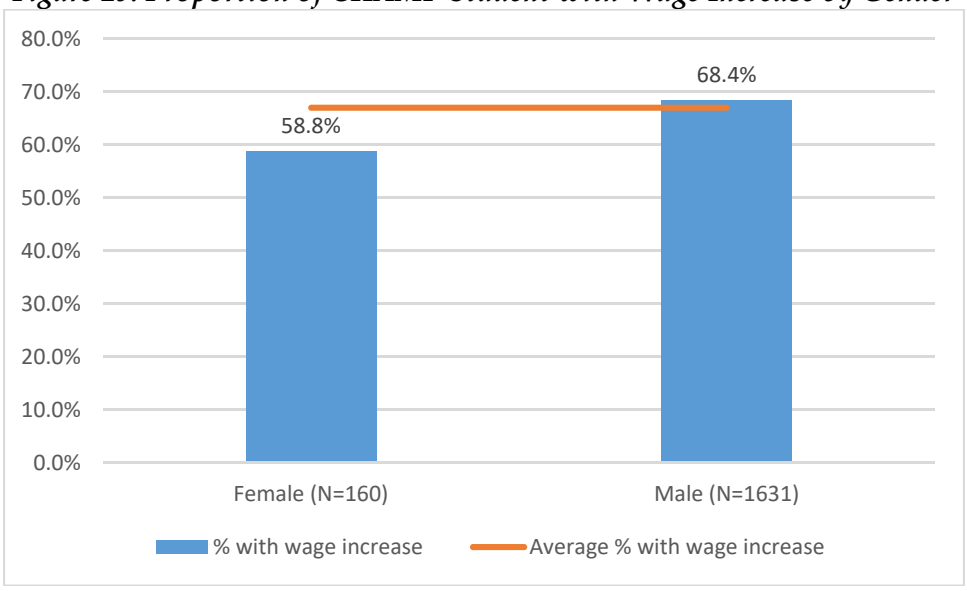
Figure 28. Proportion of CHAMP Student with Wage Increase by School



By Gender

Male incumbent workers experienced a higher rate of wage increase than incumbent female workers, 68.4 percent as compared to 58.8 percent (Figure 29).

Figure 29. Proportion of CHAMP Student with Wage Increase by Gender

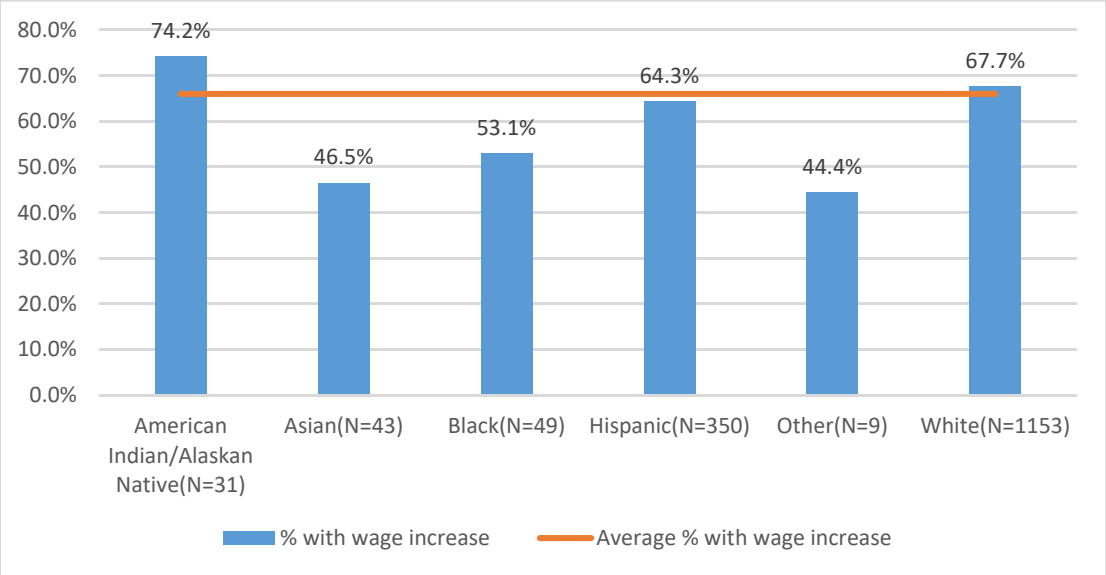


By Race/ethnicity

Incumbent wage increase by race/ethnicity is presented in Figure 30. About 74 percent of American Indian/Alaskan Native students received increases in their wages, the highest rate

across all racial/ethnic categories. White students also had a high rate of wage increase, 67.7 percent. The rate of wage increase among Hispanic students was 64.3 percent, just a few percentage points lower than the consortium average. Less than half of incumbent Asian workers experienced a wage gain. Black incumbent workers did slightly better with a 53.3 percent experiencing wage increase. But, this is still at least 13 percent lower than the consortium average.

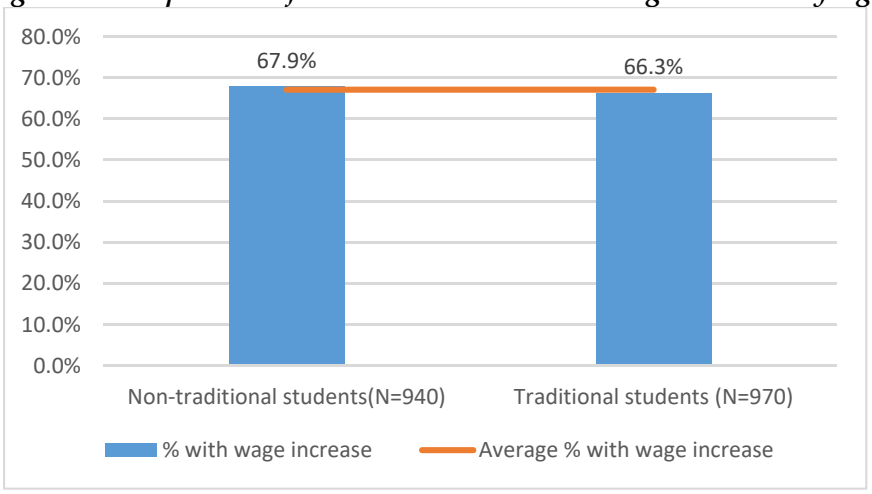
Figure 30. Proportion of CHAMP Student with Wage Increase by Race/ethnicity



By Age

There was no real difference between the rates of wage gain for traditional and non-traditional students, 67.9 percent and 66.3 percent respectively (Figure 31). It, therefore, seems that age does not have an impact on the probability of a wage increase.

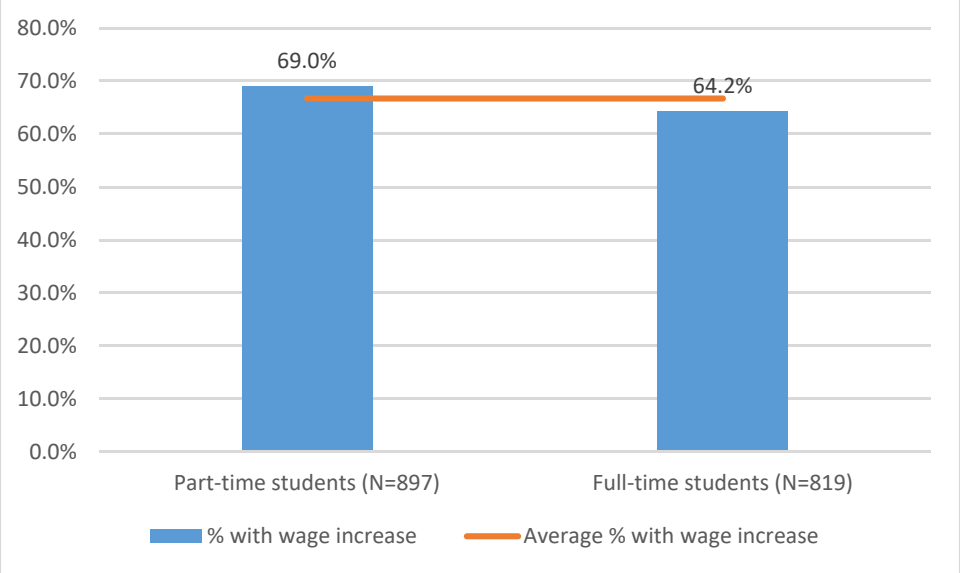
Figure 31. Proportion of CHAMP Student with Wage Increase by Age



By Full-Time Status

Comparing wage increases by student registration status, we find that part-time incumbent students had a slightly higher probability of a wage increase than full-time incumbent students, 69 percent vs. 64.2 percent (Figure 32). Without examining other factors such as type of credential and type of jobs in which students were employed, it would seem that some or most of these students moved from part time to full time employment and thus a change of wage. However, we lack the data to confirm this was the case.

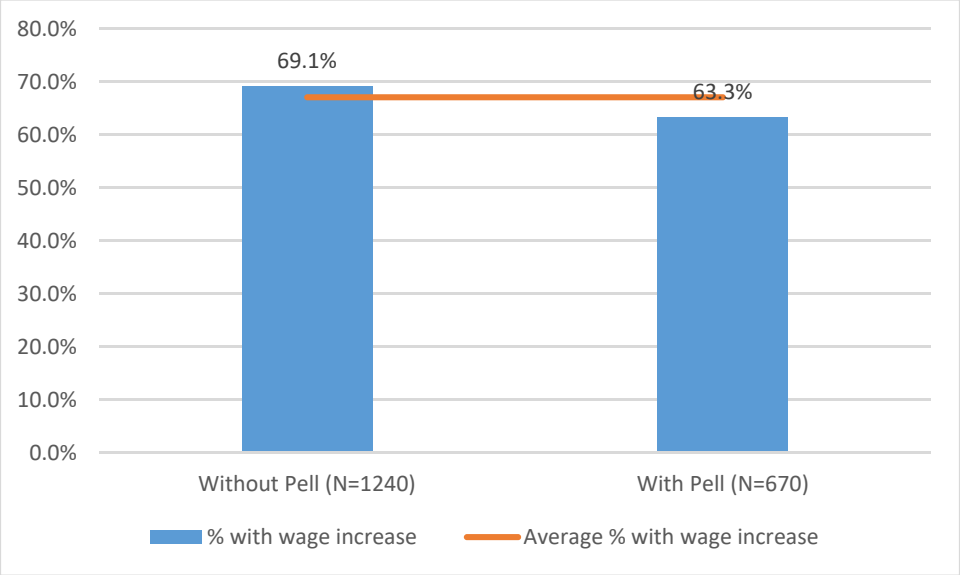
Figure 32. Proportion of CHAMP Students with Wage Increase by Registration Status



By financial aid status

There is a 6 percent difference in the proportion of CHAMP students with or without financial aid who experienced a wage increase, 63.3 percent vs. 69.1 percent (Figure 33). It is not clear if this reflects that students without aid had better jobs with more potential for promotions and wage increases or other factors.

Figure 33. Proportion of CHAMP students with wage increase by Pell status

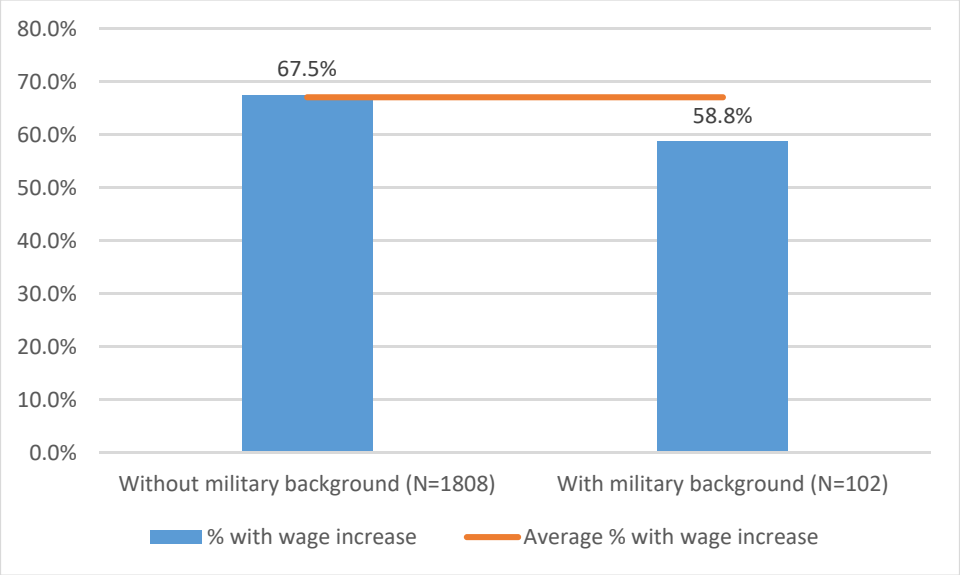


By Military background

Only 102 students in the entire CHAMP population served in the military and showed up in the UI dataset as employed at the time they enrolled in a CHAMP program.[36] Incumbent students with non-military backgrounds experienced almost nine percentage points more in wage gains than those with military backgrounds, 67.5 percent vs. 58.8 percent (Figure 34). Again, it is unclear what contributed to this difference. It is possible that military incumbent workers started with higher paying jobs, and the wage gain is restricted in the short period of observation.

[36] Students working for the military would not show up in the UI data set.

Figure 34. Proportion of CHAMP Students with Wage Increase by Military Background



In summary, the rate of wage increase varies by gender, race/ethnicity registration status, military background, and financial aid status. The cross-tab associations presented in this report suggest future analysis should be conducted addressing the differences in the rate of wage increase using these variables.

SUMMARY OF ACADEMIC AND EMPLOYMENT FINDINGS

The study period for the CHAMP programs extended from spring 2014 through the fall of 2016. This is a fairly short study period to track academic and employment outcomes across the CHAMP consortium, and at the individual participating colleges. The findings thus are only preliminary outcomes and not necessarily suggestive of on-going patterns. Nevertheless, they suggest some important areas for further study to clarify what factors have contributed to positive outcomes; and how the colleges, and the system, might harness these factors for the long term.

In the following section, EERC summarizes a few of the significant findings.

Retention rate

During the study period, about 47 percent of CHAMP students who had not yet earned a credential or degree remained in enrolled. In addition, 40 percent of students who already earned at least one credential during the study period, remained enrolled in CHAMP to pursue additional credentials. However, EERC observed that over the study period, for both types of students, enrollment declined over time. This was especially the case in respect to spring to fall retention rates.

Graduation rate

About thirty percent (n=1290) of all CHAMP students (n=4,354) graduated with at least one credential (certificate or degree) during the study period. Of these, 19 percent earned a short-term certificate (less than one year in the program); 1 percent earned a long-term certificate (one to two years in the program); and 9 percent earned an associate's degree. Close to 20 percent of graduates (n=240) earned more than one credential, stacking certificates and/or associate's degrees.

Over 90 percent of credential earners finished the program in six semesters,[37] or three academic years.

Full-time students were far more likely to graduate than part-time students (40 percent versus 22 percent). Students who received financial aid were somewhat more likely to graduate than students who did not (about 35 percent versus about 26 percent). Students with a military background were also somewhat more likely to graduate than those without one (37 percent versus 29 percent).

Graduation rates did not vary much by race or ethnicity, with the exception of American Indian/Native Alaskan students, who were the most likely to graduate at 37 percent with a credential and black students who were the least likely at 25 percent.

Employment rate

Forty-four percent of CHAMP students were employed at the time of enrollment (incumbent workers). Of those who were not, 30 percent got a job in the first quarter after they earned their first CHAMP credential. Those who earned a long-term certificate had the highest rate of employment (40 percent); the rate was 30 percent for those who earned a short-term certificate and 26 percent for those who earned an associate's degree.

The likelihood of finding a job was higher for traditional-age CHAMP graduates (25 or younger) than non-traditional-age students (about 34 percent v. about 24 percent), and far higher for white and Hispanic graduates (about 31 percent and about 34 percent, respectively) than for black or Indian American/Native Alaskan students (5percent and 7percent, respectively). Graduates with a military background were less likely to find a job than those without one (23 percent v. 31 percent).

Wage Increase

Sixty-seven percent of incumbent workers in CHAMP received a quarterly wage increase of more than $500 at some point after they enrolled. Men were more likely to see an increase than

[37] Note, no summer sessions are included here.

women (68 percent v. 59 percent). American Indian/Native Alaskans saw an increase at a somewhat higher rate (74 percent) than the average for all incumbent workers; the rates at which whites and Hispanics saw an increase were roughly in line with the average (68 percent and 64 percent, respectively); blacks and Asians saw an increase at lower-than-average rates (53 percent and 47 percent, respectively).

Full-time students were slightly less likely to see an increase than part-time students (64 percent v. 69 percent). Students who received financial aid were somewhat less likely to see an increase than their counterparts (63 percent v. about 69 percent). Students with a military background were less likely to see an increase than their counterparts (59 percent v. 68 percent). This negative association between full time status and wage increase may be because time constraint and conflict when working and studying at the same time. Financial aid may have helped students remain in school and graduate by alleviating the financial burden of the students. However, it may also curb students' desire for wage gain. Incumbent students with military background may be constrained by their military service requirements for wage gain.

AREAS FOR FURTHER STUDY

The federally funded TAACCCT CHAMP project ended on September 30, 2017. Many of the participating colleges are committed to continue the work started under CHAMP including refining curriculum, working collaboratively with regional employers; and identifying strategies to facilitate students' retention and graduation.

EERC's analysis has identified some important outcome patterns that need to be followed up to determine how durable they are, and what factors contributed to them. To begin that process, it will be necessary to continue to track over time the students who graduated with one or more credentials; those who continue to be engaged in their studies; as well as those students who were enrolled in non-credit courses, or who never completed a credential.

In addition, it will be important to study more deeply the synergy or interactions of various factors such as full and part time study, and financial aid; the effect of students' clarity about academic and career goals on retention and graduation; the costs and benefits or specific credentials both for incumbent and new job seekers; and the impact of stacked credentials on employment and wage outcomes.