# Pathways to Boosting the Earnings of Low-Income Students by Increasing Their Educational Attainment

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# Executive Summary

Attaining a post-secondary credential has become increasingly important for securing opportunities to get high-return jobs in the United States in the 21st century. Students from low-income families are underrepresented at every milestone in the educational pipeline. That limits their ability to attain post-secondary credentials and break the intergenerational transmission of poverty. This study seeks to identify educational pathways to high-paying careers that may improve social mobility. We also assess the extent to which successful transit of these pathways is contingent upon students' educational preparation and performance.

This study uses comprehensive data on the high school, postsecondary, and workforce experiences of every public school student in the state of Florida belonging to a cohort of 144,545 students in the 9th grade in 1996. Florida has one of the lowest high school graduation rates in the country, and thus faces particular challenges to increasing the educational attainment of its students. The following sections summarize the key findings from our analyses.

**The Effect of Education on Earnings**

- Higher levels of postsecondary degrees are associated with higher earnings. However, certificates from two-year colleges also lead to well-paid careers, particularly among low-performing students.
- Professional and health-related fields of academic concentration are associated with high earning among all degree programs. For students with credentials from four-year colleges, concentrations in science, technology, engineering and mathematics (STEM) tend to be the most lucrative.
- Across concentrations and degree programs there is considerable overlap of earnings between the 25th and 75th percentiles.

**Postsecondary Outcomes**

- High school preparation and performance are key predictors of postsecondary persistence and credential attainment. High-performing students are also the most likely to select concentrations associated with high post-college earnings.
- Low-performing students are unlikely to remain in college for more than a year or receive a credential. Many of these students concentrate their courses in remedial subjects.
- Among low-performing students who do persist beyond the first year of college, those that concentrate in health-related or professional fields at two-year colleges have the greatest likelihood of attaining a credential.

**Differences in Earnings and Postsecondary Outcomes by Family Income**

- Low-income students are underrepresented at every stage of the educational pipeline, from high school graduation to the completion of postsecondary curricula. The gap by family income increases at each educational milestone.
- Six years after high school, students from low-income families earn approximately 10 percent less than their peers. Over one-third of this gap in earnings is attributed to differences in high school completion, college attendance and persistence, choice of concentration, and postsecondary credential attainment.

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# Introduction

Now, as never before, the economic well-being of American workers depends on their education and training. For over 25 years the earnings gap between those with and without a college degree has been widening, as has the gap between high school graduates and dropouts. The problem isn't a shortage of post-secondary education programs. There has been a major expansion of courses offered at community colleges, and to a lesser extent, expansion of places in entering classes at four-year colleges. There also has been pressure on the K-12 education system to ensure that all students attain competency in core academic skills through the inception of high-stakes testing, which has been fostered by the No Child Left Behind (NCLB) Act.

One part of the problem is that too many students leave high school before obtaining the skills needed for further education and for the job market. Low-income students are at a particular disadvantage due to the presence of systematic barriers to educational attainment, thus perpetuating an intergenerational cycle of poverty. Another part of the problem is that differences in neighborhoods, schools, peer groups, and family resources contribute both directly and indirectly to barriers to academic aspirations and achievement. As a result, even high-performing low-income students are underrepresented throughout the upper strata of the educational pipeline. Research on income disparities in educational attainment indicates that:

- Students from the lowest quintile of family income are six times more likely to drop out of high school than students from the highest income group (Wirt et al., 2004).
- Six out of ten high school graduates from families earning less than $33,000 a year attend college, compared to nine out of ten graduates from families earning more than $88,000 (Gladieux, 2004).
- More than 40 percent of students in the top income quartile attain a bachelor's degree within five years of entering college, compared to 6 percent of students from the lowest income quartile (Fitzgerald & Delaney, 2002).
- Only 3 percent of the freshmen at the 146 most selective colleges and universities in the country are from families in the bottom quartile of income (Carnevale & Rose, 2003).

This study examines in detail the hurdles that must be overcome to increase the earnings of American workers, especially low-income workers, through better education and training, and practical ways to overcome some of those hurdles. We assess which high school and community college courses lead to higher-paying jobs and greater social mobility, and assess the extent to which different pathways through high school lead to opportunities to enter well-paid careers. We focus on the extent to which completion of high-return postsecondary courses is, and is not, dependent on successful completion of a rigorous high school curriculum. We examine how credential attainment of high-performing low-income high school students compares to that of their higher-income counterparts. For low-performing, low-income, high school students, we determine the extent to which earnings could be raised by better selecting postsecondary fields of study. In particular, we address the following questions:

- What are the educational pathways to high paying jobs that keep students out of poverty as adults?
- How do these pathways differ for students whose high school performance differs?
- To what extent do low-income students take advantage of pathways available to them?

By examining the connections among high school preparation, postsecondary education success, and success in the labor market, we provide information policy makers need to develop strategies

that can improve education outcomes and increase earnings for a range of students, especially those with poor performance in high school. Our findings, which are similar to those from a recent study on Career Academies (Kemple, 2008), suggest that development of career-oriented skills often opens the best pathway to enhanced earnings for low-performing high school students, but these pathways too often are overlooked. If this is the case, improving assessment and counseling so students develop a realistic understanding of their options would be helpful, as would increasing the quality and quantity of career-oriented programs. At the same time, differences in degree attainment between low-income and other students with comparable high school preparation suggest that more might be done to make college affordable.

# Comparison of Florida to Other States

Our analysis uses longitudinal student records from the state of Florida. They offer exceptional detail about hundreds of thousands of students' high school, college, and employment experiences. No state has the detailed data on high school grades and courses that Florida has. And only a few states have the data spanning a sufficient period to track individual students from high school to postsecondary education and into the workforce. To provide context for our study, we start by comparing Florida to other states' indicators related to high school graduation and postsecondary participation, academic preparation, postsecondary affordability, and credential completion. The period covered by these indicators closely correspond to the timeframe of our analysis, which follows a cohort of students that entered the 9th grade in the 1996 academic year and would be expected to graduate in 1999.

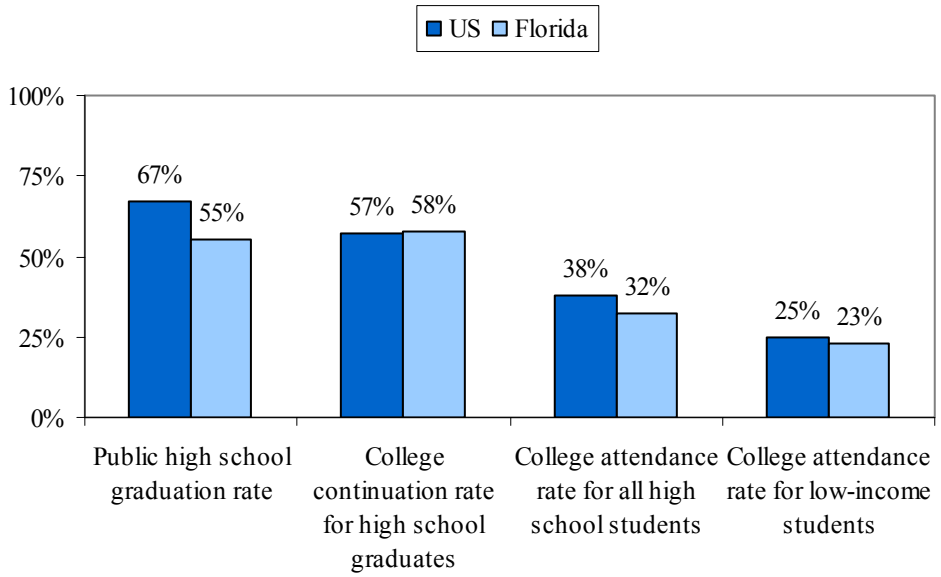
*High School Graduation and Postsecondary Participation*

The four-year graduation rate[1] for public high schools was 55 percent in Florida during the year 2000 (see Figure 1). This graduation rate is considerably lower than the national average of 67 percent, and Florida ranked 47th in the nation on this indicator. Approximately 58 percent of high school graduates in Florida continued their education by enrolling in college by the fall semester following graduation. This college continuation rate for high school graduates in Florida was similar to the national average of 57 percent. However, because of Florida's low graduation rate--only 32 percent of students graduate from high school *and* enroll in college by the fall semester following graduation. Florida ranks 43rd in the nation in college attendance rate. Yet, despite the challenge of a low high school graduation rate, the college attendance rate for low-income students[2] in Florida is close to the national average of 25 percent.

[1] The public high school graduation rate cited here is the ratio of fall 9th grade enrollment divided by regular high school graduates 4 years later. The official statewide four-year graduation rate provided by the state of Florida during this time was 62.3%. This figure may be more accurate since it is based on longitudinal tracking of individual student records; however comparable information is not available for other states.

[2] The college attendance rate for low-income students is an estimate based on the number of dependent Pell Grant recipients divided by the number of FRL students enrolled in grades 4-9. (FRL refers to students who get free or reduced-price lunches.)

**Figure 1: High school graduation and postsecondary participation indicators, 2000[3]**




Source: Postsecondary Education Opportunity (www.postsecondary.org) and author calculations

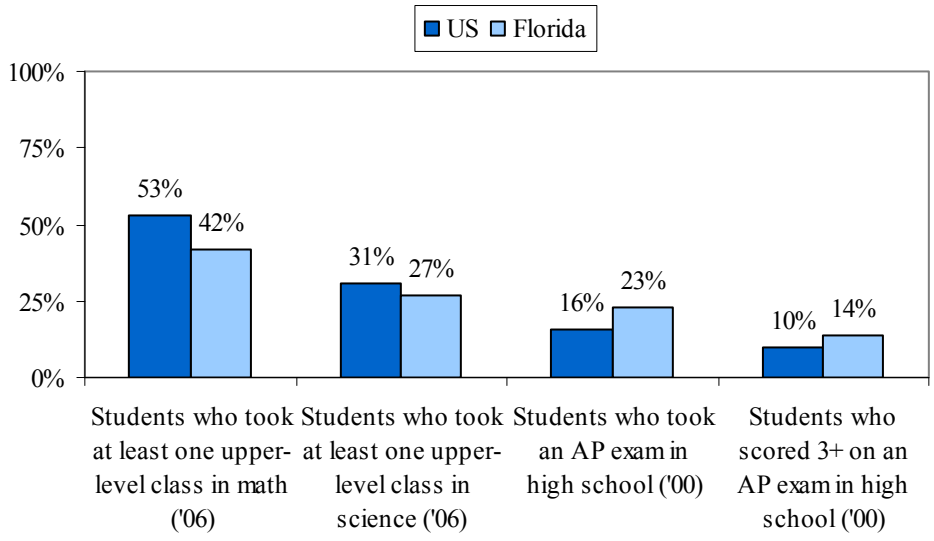
*Academic Preparation*

Figure 2 compares the academic preparation of Florida high school students to that of students in other states. Overall, fewer Florida high school students participated in upper-level academic courses relative to the US average, with only 42 percent of Florida students taking at least one upper-level math class and 27 percent taking at least one upper-level science class.[4] However, Florida students performs relatively well on indicators of Advanced Placement (AP) participation and performance compared to the US average. Nearly one-quarter of Florida high school students took an AP exam in high school and 14 percent received a score of 3 or higher. Although we do not have comparable national statistics, Florida also has a strong dual enrollment program that enables 17 percent of high school students to take college courses while still in high school, and leads 86 percent of these students to earn college credit in 2001 (State of Florida, 2007).

[3] Statistics were compiled from the following Excel spreadsheets at www.postsecondary.org:
- Public High School Graduation Rates by State, 1981 to 2006
- Chance for College by Age 19 by State, 1986 to 2004
- College Participation Rates for Students from Low Income Families by State, FY1993 to FY 2006

[4] Upper-level math courses include geometry, algebra 2, trigonometry, pre-calculus, or calculus. Upper level science courses include chemistry or physics, second-year biology, AP biology, second-year earth science, or other advanced science courses.

**Figure 2: Academic preparation indicators, 2000 and 2006**




Sources: College Board, "Advanced Placement Report to the Nation," 2007.
The National Center for Public Policy and Higher Education, "Measuring Up," 2006.

*Postsecondary Affordability*

In 2000, the median annual in-state undergraduate tuition for Florida public colleges was $1,455 for two-year colleges and $2,392 for four-year colleges (see Table 1). At both types of institutions, tuition rates were below the national median. The percent of family income required to pay tuition for students in the lowest quintile of income was 13 percent for two-year colleges and 21 percent for four-year colleges in Florida. The majority of students in the state received some form of federal, state, or institutional financial aid; although more students received financial aid at four-year colleges than two-year colleges. The average federal grant (consisting primarily of Pell Grants for low-income students) exceeded the median cost of tuition at two-year and four-year colleges. However, Florida provides a smaller percentage of need-based aid relative to the national average (29 percent versus 52 percent). The state supports a large merit-based program, the Bright Futures Scholarship, which was initiated in the fall of 1997. The Bright Futures Scholarship provides students with 100 percent of tuition and fees, as well as funds for other college-related expenses. The scholarship is available to all students who meet the requirements for high school GPA (a minimum of "B" for four-year colleges or "C" for two-year colleges), ACT/SAT scores, college preparatory courses, and community service hours. In summary, a variety of need-based and merit-based aid is available to cover the cost of tuition at public two-year and four-year colleges in Florida. Thus, forgone earnings and living expenses associated with attending college represent the primary barriers to postsecondary affordability for many students.

**Table 1: Postsecondary affordability indicators, 2000**

| | US | FL |
|---|---|---|
| **2-Year Colleges** | | |
| Median in-state undergraduate tuition | $1,710 | $1,455 |
| Average federal grant award at public colleges | $2,205 | $2,267 |
| Percent of family income required to pay tuition for the lowest quintile of income | 15% | 13% |
| Students receiving federal, state or institutional financial aid | 60% | 59% |
| **4-Year Colleges** | | |
| Median in-state undergraduate tuition | $3,206 | $2,392 |
| Average federal grant award at public colleges | $2,496 | $2,623 |
| Percent of family income required to pay tuition for the lowest quintile of income | 28% | 21% |
| Students receiving federal, state or institutional financial aid | 73% | 82% |

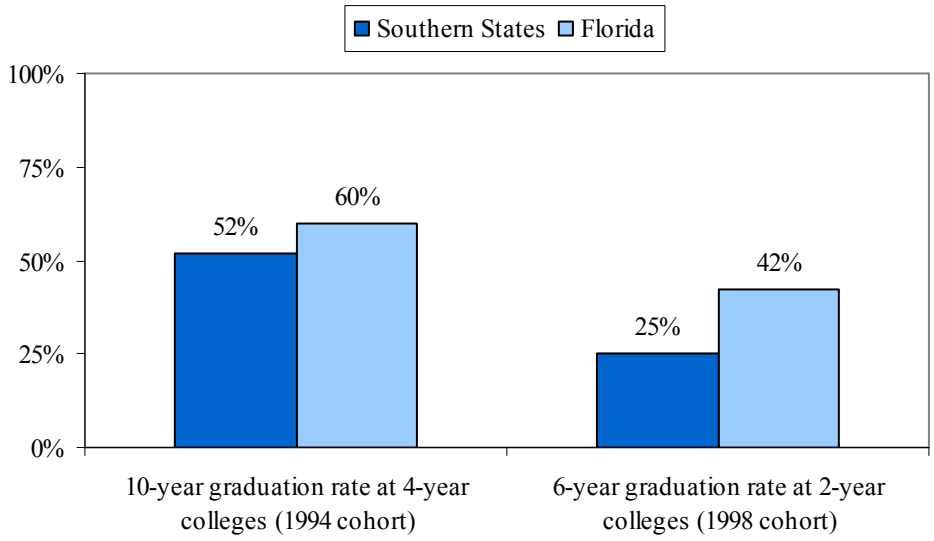
Source: Southern Regional Education Board (SREB) Data Library (http://www.sreb.org/DataLibrary/datalibindex.asp).

*Credential Completion*

Figure 3 shows that 60 percent of full-time, degree seeking freshmen at public Florida four-year colleges completed a bachelor's degree within 10 years, compared to an average of 52 percent in other Southern states.[5] Florida also performs well above other states in the region on two-year graduation rates with 42 percent of students starting degree programs at two-year colleges obtaining a credential within 6-years, compared to the average of 25 percent for the Southern region.

[5] The comparison group of Southern states includes the 16 member states of the Southern Regional Education Board (SREB): Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

**Figure 3: Credential completion indicators**




Source: Southern Regional Eduction Board (SREB) Data Library (http://www.sreb.org/DataLibrary/datalibindex.asp).

**Summary**

Our comparison of Florida to other states indicates that:

- Florida has low high school graduation rates and college attendance rates compared to the US average.
- While fewer students in Florida take upper-level courses in math and science than the US average, the state has strong college-level Advanced Placement and Dual Enrollment programs.
- Florida has low college tuition rates and the majority of students receive financial aid. High-performing students and low-income students are eligible to receive sufficient aid to more than cover tuition. Thus, college affordability in Florida depends largely on foregone earnings, living expenses, and students' need to provide support for their families.
- Florida has high credential completion rates for students entering credential-issuing programs at two-year and four-year colleges relative to other states in the region.

# Previous Research

### *What do we know about the effect of education on earnings?*

Previous research has examined the association between earnings and factors such as high school courses taken, choice of major, level of education, and type of institution attended.

*High School Courses*

Few prior studies have examined the relationship between high school courses taken and labor market outcomes. There is some evidence that the number and level of high school math classes has a significant positive effect on earnings, even after controlling for student background characteristics and college major (Levine & Zimmerman, 1995; Rose & Betts, 2004). However, there is little to no effect from the number of high school courses completed in other subjects such as humanities and science (Altonji, 1995; Levine & Zimmerman, 1995).

*Choice of Major*

The effect of courses taken on earnings is much larger at the college level than the high school level. There are significant differences in earnings by choice of major even after accounting for differences in student ability (Arcidiacono, 2004; Del Rossi & Hersch, 2008). Earnings are higher following completion of programs in quantitative fields including math, science, engineering, technical vocational, and business courses rather than in non-quantitative fields, and the earnings differences grow over time (Grubb, 1997; Jacobson, LaLonde & Sullivan, 2005; Rumberger & Thomas, 1993).

*Level of Education*

Studies that have used large nationally representative databases have consistently indicated that a year of postsecondary education boosts earnings by 8-12 percent. In estimating the returns, many of these studies also took account of selection bias by controlling for characteristics such as test scores that may be correlated with earnings (Grubb, 1993; Ashenfelter & LaLonde, 1997; Heckman et al., 2003). Earnings tend to be slightly higher for students who attain credentials relative to students without credentials who have completed the same number of courses (Grubb, 1997; Kane & Rouse, 1995). However, higher levels of educational credentials are not always associated with higher earnings. For example, some community college certificate programs are associated with higher earnings than are associate degree programs (Kerckhoff & Bell, 1998).

*Type of Institution Attended*

Only a few studies have examined the effect of community college versus four-year college courses (Grubb, 1993; Kane & Rouse, 1995, 1999). These studies indicate that course-for-course the returns to community college and four-year college attendance are comparable. Thus, attaining a four-year degree typically raises earnings twice as much as attaining a two-year degree mainly because attaining a four-year degree requires completing twice as many courses. There is some evidence that attaining a credential has a greater effect on earnings than the type of institution attended. Students who complete a community college credential tend to have higher earnings than four-year college students who do not graduate (Gill & Leigh, 2003; Grubb, 1997).

## *What do we know about the choice of college major?*

Since returns to education vary among courses in different fields of study, it is important to understand what factors affect selection of college major. Academic ability, performance during college, and expectations about future earnings all influence selection of college major.

*Academic Achievement*

Students with strong academic achievement, particularly in math, tend to select the most lucrative majors (Arcidiacono, 2004; Maple & Stage, 2001). However, even after controlling for differences in academic performance, gender and race are significant predictors of major selection. Women and racial/ethnic minorities are less likely to enter quantitative fields, particularly in math and physical science (Maple & Stage, 2001; Rask & Tiefenthaler, 2008; Turner & Bowen, 1999).

*Performance during College*

The choice of major is consistent with a process by which students use college to learn about their ability to complete different courses and to determine their career interests. Students with low college GPAs are more likely to change majors or drop out (Arcidiacono, 2004). Yet the influence of college performance on choice of major varies among different groups of students. Grades may have a stronger effect on the choice of college major for women than men (Rask & Tiefenthaler, 2008). In addition, students from low socioeconomic backgrounds are more likely to take into account the difficulty of each field of study and select majors with a high probability of degree completion (Montmarquette, Cannings & Mahseredjian, 2002).

*Expectations of Future Earnings*

Students also tend to take into account expectations about future earnings when making decisions about college majors. Long-term differences in earnings across majors are a better predictor than differences in starting salaries (Berger, 1988). Students also consider the future earnings associated with graduate education when selecting undergraduate majors in liberal arts and science (Eide & Waehrer, 1998). Expectations about future earnings have a greater effect on the choice of college major for males and non-white students (Freeman & Hirsch, 2008; Montmarquette, Cannings & Mahseredjian, 2002).

## *What do we know about college persistence and degree completion?*

Returns to education are also affected by the number of years of education completed and the type of credential attained. Research indicates that college persistence and degree completion are influenced by courses taken in high school, financial aid, and to a lesser extent, the type of institution attended.

*Course Selection in High School*

Completing a rigorous high school curriculum is positively associated with the number of years of postsecondary education completed and the probability of attaining a bachelor's degree (Adelman, 2006; Altonji, 1993; Horn & Kojaku, 2001). Among high school courses, the highest level of math completed is the strongest predictor of degree completion. Furthermore, students who take non-remedial math courses at the college level are also more likely to attain a bachelor's degree.

*Financial Aid*

Overall, the receipt of financial aid has a positive effect on persistence and degree completion, especially among low-income students (Dynarski, 1999; Ishitani & DesJardins, 2002; Wei & Horn, 2002). There is some evidence that merit-based grants have a greater effect on persistence and degree completion than do need-based grants or loans, even after accounting for differences in student background characteristics (DesJardins, Ahlburg, & McCall, 2002; Heller, 2003). Students who work less than 15-20 hours per week during college to help pay for their education are less likely to drop out of college than students who do not work at all; however, working more than 15-20 hours has a negative effect on persistence and degree completion.(Choy, 2000; Horn & Berktold, 1998; King, 2002).

*Type of Institution Attended*

There is mixed evidence regarding whether students who begin their postsecondary education at a two-year college are less likely to attain a bachelor's degree. According to one estimate, BA seeking students who begin at a two-year college are 14.5 percent less likely to complete a BA within 9 years (Long & Kurleander, 2008). Yet another study found that students starting at two-year and four-year colleges had similar odds of attaining a BA, although time-to-degree tended to be longer for students starting at a two-year college (Rouse, 1995). In addition, there is some evidence that students are less likely to drop out if they attend a college where the average ability of the students is similar to their own ability (Light & Strayer, 2000).

# Data

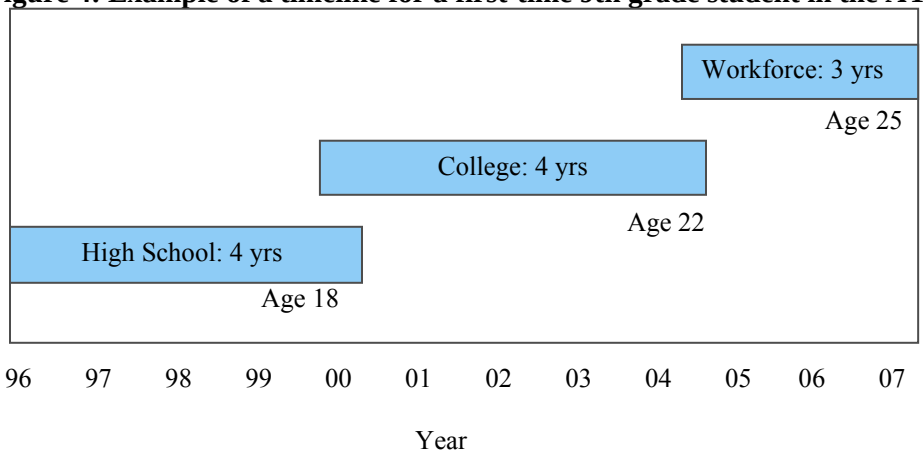
The state of Florida maintains the largest and most complete set of administrative data available for analyzing the effect of education on earnings. Student-level records can be linked across multiple databases that include high school transcripts, high school attendance and enrollment records, student demographics, college transcripts, college credentials, and quarterly wage records from the Florida unemployment insurance system. These data allow us to examine the effect of taking specific college courses on subsequent earnings, and the extent to which different types of high school preparation are associated with successful completion of high-return courses.

The data include records for every student attending a Florida *public* high school or *public* postsecondary institution from 1995 to 2005, and Florida quarterly wage records for each of these students through 2007. Our primary database includes all first-time 9th graders in the 1996 academic year (AY 1996).[6] Although the amount of time spent in high school, college, and the

[6] We used data for first-time 9th graders in Academic Year 1996, the second earliest year available, to determine which of these students received free and reduced price lunches (FRLs) in the 8th grade. It is well known that many eligible students do not apply for FRLs when they reach high school.

workforce differs among students, figure 4 provides an example of a timeline with the student's age and amount of time spent at each stage for a "typical" cohort member who graduates from high school after 4 years in the Spring of 2000 (at the end of AY 1999), enters college in the Fall of 2000, remains in college for 4 years, and then enters the labor force. The overlap in the bars is to suggest the variation in the actual experience of students.

**Figure 4: Example of a timeline for a first-time 9th grade student in the AY 1996 cohort.**




One of the major advantages of the Florida data is that they include records for every public school student in the state, rather than a representative sample. While national surveys such as the National Longitudinal Survey of Youth (NLSY) and High School & Beyond (HS&B) contain only a few thousand students per cohort, our 9th grade AY 1996 cohort includes records for over 220,000 students. The Florida database also is one of the few sources that track students from high school to college and into the work force. In addition, it consists of some of the most up-to-date data available with wage records through 2007.

Yet working with the Florida data also poses a number of challenges for our analysis. It is uncertain whether students not completing the 12th grade dropped out of high school, transferred to a private high school, or attended school in another state. Similarly, it is unclear whether high school graduates who do not enter a Florida public college attended private (for-profit and non-profit) or out-of-state postsecondary institutions. In addition, we do not know whether students with zero earnings are not working by choice, unemployed, working in an uncovered government sector, self-employed, or working in another state. Further, we do not know if post-schooling earnings are low because the former students choose to work part-time. As a result of these data gaps, the majority of our analysis focuses on students who: (a) reached the 12th grade; (b) attended a public college in Florida; and (c) had post-schooling earnings at least equal to the equivalent of a full-time job at the federal minimum wage.

We also had no variable indicating each student's field of concentration, so we had to infer this information from college transcript records. All college courses were categorized into one of the following eight groups: health-related, humanities, professional, remedial (includes remedial courses in math and language arts), social science, STEM (science, technology, engineering, and mathematics), voc-tech (vocational or technical), and other. A complete list of courses included in each group appears in Appendix 1. For students who attended a four-year college, concentration was defined as the field in which students completed the greatest number of upper-level courses. Two-year colleges do not offer upper-level courses. So concentration was defined as the field in

which students completed the greatest number of courses. Students with the same maximum number of courses in more than one category were assigned to the category "other" concentrations. Any student who did not complete at least 24 credit hours (equivalent to one year of full-time courses) was not assigned a field of concentration. As a result of taking a common core of liberal arts and/or prerequisite courses prior to entering a specific field of specialization, the field of specialization would be indeterminate.

The Florida data offer a broad array of student demographic characteristics including gender, race, age, mental handicaps, and Limited English Proficiency status; however, there is little information available about students' socioeconomic status. The only variable related to family income is whether a student participated in the federally funded free and reduced price lunch (FRL) program during the eighth grade.[7] Thus, comparisons of the educational experiences and earnings of low-income students with that of other students are limited to comparisons between FRL students and non-FRL students.

Our initial data file consisted of 220,009 students who entered the 9th grade at a Florida public high school for the first time in 1996 and completed at least one course in the 9th grade. We excluded two percent of the observations because the student had reports for 20 or more courses in any one semester. We assume that these records were cases where several students had the same ID number. We also excluded students who were repeat 9th graders in 1996[8] (17 percent) and students enrolled in the 9th grade in 1996 who did not take a single course at a Florida public school in that year (15 percent). The final file included a cohort of 144,545 students who were first-time 9th graders taking at least one course at a public school in the 1996 academic year.

# Florida's Educational Pipeline

Figure 5 illustrates the percentage of students continuing to each stage in Florida's educational pipeline. The dark blue bars represent the percentage of students at each stage actually observed in the database, whereas the light blue bars indicate our best estimate of the additional unobserved students that may be attending private or out-of-state institutions. Among all of the students entering the 9th grade for the first time in 1996, 59 percent reached the 12th grade at a Florida public high school. However, an additional 7 percent to 15 percent of the 9th graders may have graduated from private high schools in Florida or from high schools in other states.[9] The database does not provide any indicators of whether students graduated from high school, but publicly

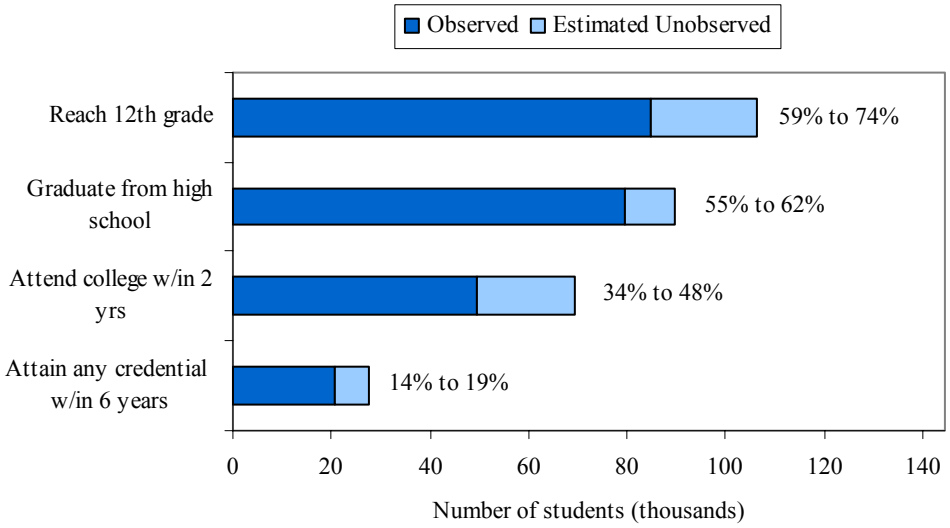
[7] Families are eligible for the FRL program if they have an annual income less than 130% of the federal poverty guidelines for free lunch, and 130% to 185% of the federal poverty guidelines for reduced price lunch. In 2007-08, the maximum annual income for a family of four was $26,845 for students getting free meals and $38,203 for those getting reduced price meals (http://www.fns.usda.gov/cnd/Governance/notices/iegs/IEGs07-08.pdf).

[8] Students who were repeat 9th graders in 1996 were excluded so that a single cohort of students could be followed. Our sample includes students who entered the 9th grade for the first time in 1996 and then repeated the 9th grade in 1997 and subsequent years.

[9] The estimate of students reaching 12th grade was based on the assumption that almost all students with an A GPA in high school will reach the 12th grade. In our sample, 85% of A students had high school transcript records in grade 12, so the remaining 15% were likely to have transferred to a private or out-of-state high school. The transfer rate is assumed to be similar for students in other GPA groups, while the remaining students who did not reach grade 12 in these groups are assumed to have dropped out of high school.

released estimates for the year 2000 range between 55 percent and 62 percent.[10] Approximately one-third of students in the 9th grade cohort attend a public postsecondary institution within two years of completing high school. An additional 14 percent may be attending a private or out-of-state institution. Ultimately, only a small percentage of students, less than 20 percent, receive any type of postsecondary credential within six years of completing high school.

**Figure 5: Florida educational pipeline for the cohort of 9th graders in 1996**

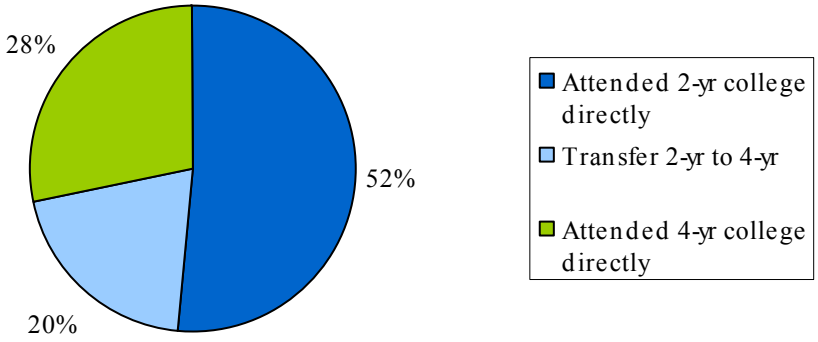



*Type of College Attended*

The pie chart in Figure 6 shows the distribution by the type of college attended by cohort members who reached the 12th grade at a Florida public high school and then entered a Florida public postsecondary institution within two years. Just over half of all students went directly to a two-year college, while 28 percent went directly to a four-year college. The remaining 20 percent entered the postsecondary education system at a two-year college and later transferred to a four-year college.

[10] These graduation rates are likely to be underestimated because they do not include graduates from private high schools, home-schooled graduates, or students who begin high school in Florida but graduated in another state. See footnote 1 for a description of the differences in the graduation rates cited here.

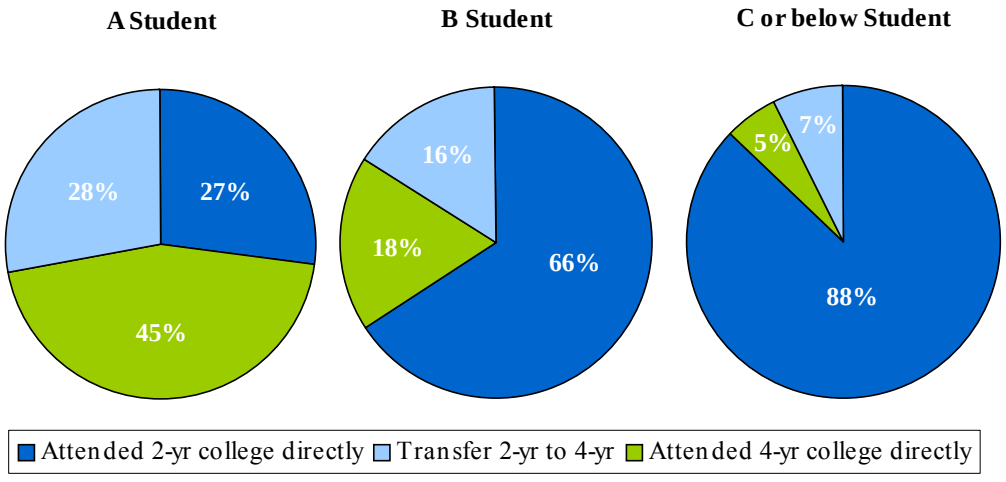
**Figure 6: Distribution of type of college attended**




*Differences in College Attendance and Type of College Attended by High School Performance*

There were substantial differences in college attendance among students with different high school GPAs.[11] The percentage of 12th graders attending college ranged from 79 percent for A students, to 63 percent for B students, to 39 percent for C or below students. The type of college attended also differed by high school performance (see Figure 7). Forty-five percent of A students attended a four-year college directly, and an additional 28 percent of A students transferred from a two-year to a four-year college. In contrast, 88 percent of students with a C or below GPA attended a two-year college.

**Figure 7: Distribution of type of college attended, by high school GPA**

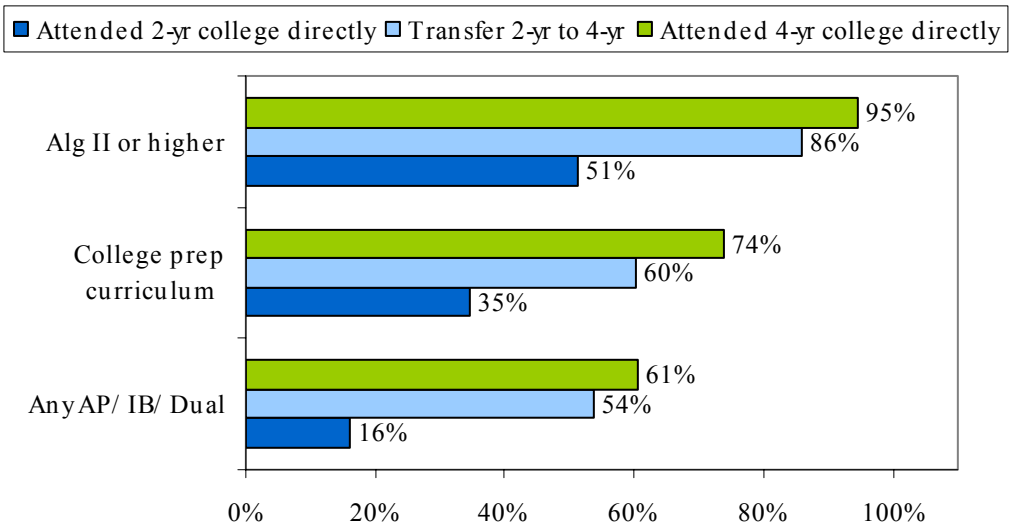



[11] GPA is measured using a 5.0 scale ranging from F=1.0 to A=5.0. GPA categories are defined as >4.0 for A students, >3.0 and ≤4.0 for B students, and <=3.0 for C or below students.

*Differences in High School Preparation and Credential Completion by Type of College*

The quality of high school preparation also differs among students attending two-year and four-year colleges (see Figure 8). Ninety-five percent of students attending four-year colleges directly completed Algebra II or a higher level math class in high school, compared to only 51 percent of students attending two-year colleges directly. The proportions of students who had completed a college preparatory curriculum ranged from 74 percent for students attending four-year colleges directly to 35 percent for students attending two-year colleges directly. (A college preparatory curriculum was defined as the minimum number of courses in each academic subject recommended for admission to Florida's State University System.[12]) Lastly, 61 percent of students attending a four-year college had directly participated in at least one Advanced Placement (AP), International Baccalaureate (IB), or dual enrollment (dual) course, compared to only 16 percent attending a two-year college directly.

**Figure 8: Differences in high school preparation, by type of college attended**

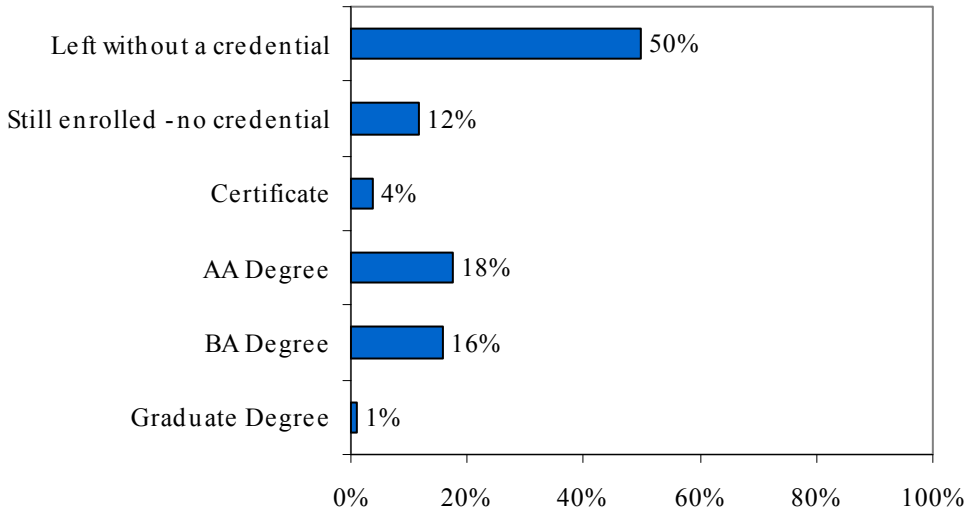



Fewer than half of the students that started at a two-year college received a postsecondary credential within six years of high school (see Figure 9).[13] Approximately 18 percent of students received an Associate's (AA) degree and an additional 16 percent transferred to a four-year college and received a Bachelor's (BA) degree. Only 4 percent of students starting at two-year colleges received a certificate; which is a technical or vocational credential that can be attained within six months to two years.

[12] In 2000, the college preparatory curriculum consisted of 4 units of English, 3 units each of math, natural science, and social science; and 2 units of a foreign language.

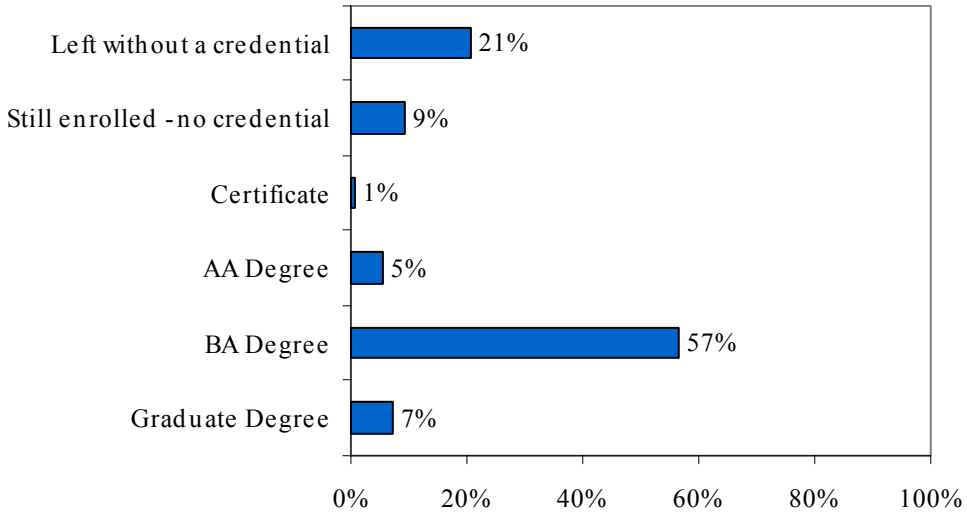
[13] The statistics cited throughout this report for credential completion rates in the Florida data include students enrolled in both credential bearing programs and non-credential bearing programs. These results are not directly comparable to Figure 3, which only includes degree-seeking students.

**Figure 9: Highest degree for students that started at a two-year college**




Comparing Figure 9 to Figure 10 shows that the highest credential attained by students starting at four-year colleges was dramatically different from those obtained by students starting at two-year colleges. Over two-thirds of four-year college starters received some form of postsecondary credential within six years of high school. The majority (57 percent) received a bachelor's (BA) degree, while an additional 7 percent received a graduate degree. Approximately 6 percent of four-year starters later transferred to a two-year and received a certificate or AA degree.

**Figure 10: Highest degree for students that started at a four-year college**




**Summary**

Observations of the educational pipeline in Florida indicate that:

- Less than 20 percent of the 9th grade cohort received a postsecondary credential within six years of leaving high school.
- There are substantial differences in college attendance by high school preparation and performance.

    - Students with A GPAs are twice as likely to attend college as C or below students (79 percent versus 39 percent).
    - Students with A GPAs are more likely than students with C or below GPAs to attend a four-year college directly (45 percent versus 5 percent) or transfer from a two-year to four-year college (28 percent versus 7 percent).
- College preparation and credential outcomes differ by type of college attended.
    - Four-year college starters are about twice as likely as two-year college starters to complete Algebra II (95 percent versus 51 percent) or a college preparatory curriculum (74 percent versus 35 percent).
    - Over two-thirds of students starting at four-year colleges receive a postsecondary credential, compared with fewer than half of students starting at two-year colleges.

# The Effect of Education on Earnings

This section examines the effect of postsecondary education on the earnings of students who reach the 12th grade and then take at least one course at a Florida public college within two years of leaving high school. Initially, we examine the effect of obtaining different credentials on the earnings of members of two different cohorts satisfying the above criteria—first time 9th graders in 1996 and 12th graders in 1996. We use tabulations for the 12th grade cohort to examine how earnings increase as the period after leaving school lengthens since we can observe earnings for up to four additional years for this cohort.

In the remaining subsections we examine only results for the 9th grade cohort for reasons described in the next subsection. We use regression analysis to show for each credential how much of the difference in earnings is associated with differences in high school preparation, college concentration (field of courses taken in college), and performance in college, as between students who obtain a given credential versus students who attend college but do not obtain a credential.

Next, we examine the effect of college concentration on earnings separately for students who attain a credential from a two-year college (certificate or AA) and students who get a BA from a four-year college. We then examine the distribution of fields of concentration among students at two-year colleges who receive certificates versus those receiving AA degrees, and estimate how differences in concentrations affect earnings. We pay particular attention to the earnings effect of obtaining a two-year certificate because it turns out be a key pathway for low-performing high school students to increase their earnings substantially.

### How We Handled Data Constraints

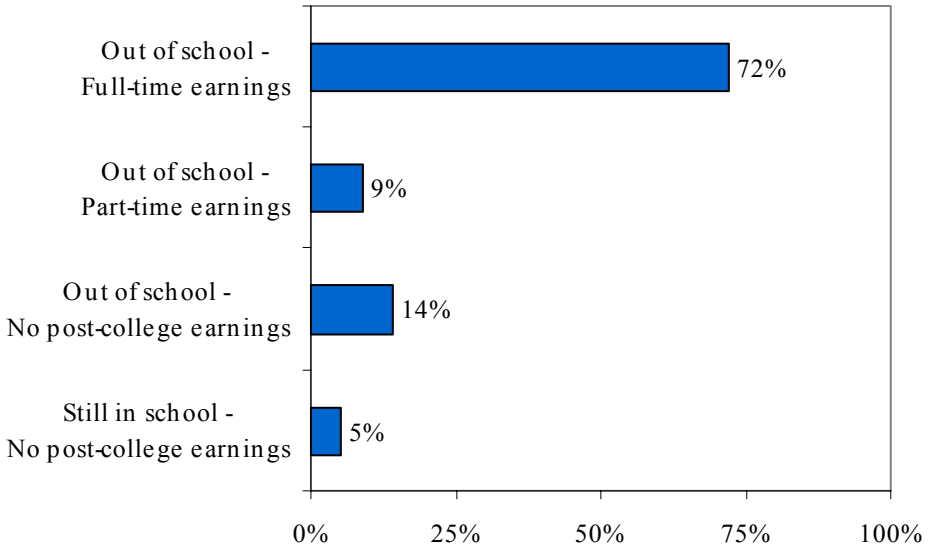
In an earlier section we described the data limitations that presented challenges to obtaining accurate results. Because of those limitations we restrict the analyses in this section, with the one exception noted above, to students in our 9th grade cohort who: (a) reached the 12th grade; (b) entered a Florida public college; (c) started college within two years of leaving high school; (d) left college before 2005; and (e) had Florida earnings covered by our data above the fulltime minimum wage in at least one calendar quarter after leaving college.

We restrict the analysis to students who reached the 12th grade to observe grades and course selection over students' entire high school careers. We estimate that about 15 percent of the students leaving Florida public high schools in our cohort attended a private high school or a high school out-of-state. We restrict the analysis to students who took at least one course at a Florida college to maximize the probability that we compare students who earned credentials against students who attended college but did not obtain a credential. About one-quarter of the students who left the 12th grade and did not attend a Florida public college may have attended a Florida private college or college in another state. We restrict the analysis to students who entered a Florida college within two years of leaving high school and who left college by 2005, in order to have at least a three-year follow-up period to estimate earnings effects. Finally, we restrict the analysis to students with at least one quarter of post-college Florida earnings above the full-time minimum wage to exclude students who might be out of the labor force by choice, working in an uncovered sector in Florida, or working in another state.

Figure 11 shows that 72 percent of the 12th graders who entered a public college within two years of high school and left college by 2005 had Florida earnings above the full-time minimum wage

in at least one quarter after college. Nine percent left school by 2005 but did not subsequently have earnings above the full-time minimum wage and 14 percent left school by 2005 but subsequently showed no earnings. The remaining 5 percent were still taking college courses after 2005. Although not shown in Figure 11, about 9 percent of the students who did not enter the 12th grade attended a Florida public college. We assume that most of these students completed high school out-of-state or at a private school in Florida.

**Figure 11: Status of post-college earnings data for students attending college within 2 years of grade 12**




## Earnings by Credential Attainment

In our analyses, we define earnings as the highest income in any quarter after college.[14] These earnings are multiplied by four to represent annual earnings, which are more meaningful to most readers than quarterly numbers. Figure 12 shows how these earnings vary by credential attainment. The number in the blue bars is the median earnings for each group. The length of each bar shows earnings between the 25th and 75th percentile. For students who left college with no credential, earnings differed between the 25th and 75th percentile by about $16,000. For students with credentials, earnings differed between the 25th and 75th percentile by about $22,000.

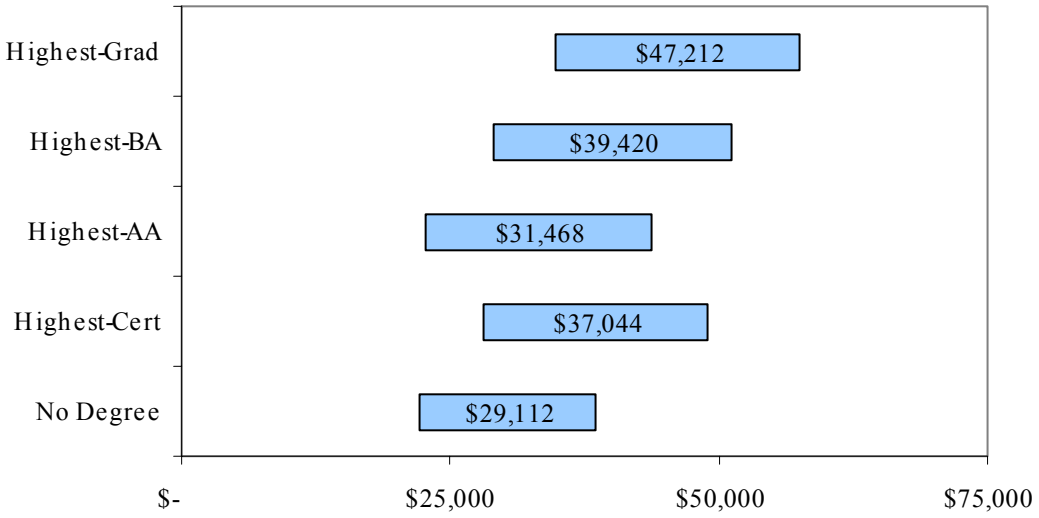
Figure 12 shows that median earnings were about $8,000 (27 percent) greater for students with a certificate relative to students who left college without a credential, but were only $2,300 (8 percent) greater for students with an AA degree. Moreover, among students at the 25th percentile, students with an AA degree had about the same earnings as students who left college with no credential. Figure 12 does not imply that all students would be better off economically by

[14] We separately used the same specifications to examine the effect of various factors on average earnings rather than high-quarter earnings. The results were very similar, but we prefer the specification using high quarter earnings because we can control for how long after leaving school those earnings were obtained.

pursuing certificates than AAs. This is because about half of the students who obtain AAs transfer to four-year colleges and obtain BAs, which on average raise earnings far more than terminal AAs or certificates. However, the results imply that substantial numbers of students struggling in AA programs might be better off if they entered certificate programs.

The median earnings of students with BA degrees were about $12,600 (35 percent) greater than for students who left college with no degree and about $19,000 (62 percent) greater for students with graduate degrees. Earnings at the 25th percentile were about $7,000 greater for students with BAs than for students who left with no degree, and $12,600 greater for students with graduate degrees.

**Figure 12: Median of Highest Earnings after College, by Highest Credential**




**How Earnings Change as Students with Different Credentials Gain Work Experience**

The preceding subsection shows earnings differences in the period 2004 through 2007 for the cohort of 9th grade students in 1996. For most students with four-year credentials this represents earnings in the first three years after leaving college. For most students with 2-year credentials this represents earnings in the first five years after leaving college. In the next section we take work experience (as measured by time since leaving high school) into account in comparing earnings differences. However, for most of the 9th grade cohort we cannot follow earnings for a uniform five years subsequent to leaving postsecondary education—the period over which earnings differences tend to continue to widen for students with progressively higher degrees. Table 2 provides a rough idea of how the earnings shown in Figure 12 change as time since leaving college lengthens.

**Table 2. Highest Annualized Median Earnings of the 9th Grade Cohort in 2004-07 and the 12th Grade Cohort in 2000-04 and 2004-07.**

| **Period** | **2004-07** | **2000-04** | | |
|---|---|---|---|---|
| **Cohort** | **9th grade** | **12th grade** | | |
| | | | Difference | |
| Highest Credential | Highest Annualized Median Earnings | | (dollars) | (percent) |
| Graduate Degree | $45,910 | $45,676 | -$234 | -0.5% |
| BA Degree | $38,880 | $36,682 | -$2,198 | -5.7% |
| AA Degree | $31,136 | $31,624 | $488 | 1.6% |
| Certificate | $37,160 | $33,568 | -$3,592 | -9.7% |
| Some college-No Degree | $29,542 | $28,340 | -$1,202 | -4.1% |

| **Period** | **2000-04** | **2004-07** | | |
|---|---|---|---|---|
| **Cohort** | **12th grade** | **12th grade** | | |
| | | | Difference | |
| Highest Credential | Highest Annualized Median Earnings | | (dollars) | (percent) |
| Graduate Degree | $45,676 | $62,824 | $17,148 | 37.5% |
| BA Degree | $36,682 | $51,532 | $14,850 | 40.5% |
| AA Degree | $31,624 | $44,082 | $12,458 | 39.4% |
| Certificate | $33,568 | $42,320 | $8,752 | 26.1% |
| Some college-No Degree | $28,340 | $36,130 | $7,790 | 27.5% |

| Highest Credential | Difference Relative to No-Degree | | |
|---|---|---|---|
| Graduate Degree | 61.2% | 73.9% | 12.7 |
| BA Degree | 29.4% | 42.6% | 13.2 |
| AA Degree | 11.6% | 22.0% | 10.4 |
| Certificate | 18.4% | 17.1% | -1.3 |
| Some college-No Degree | 0.0% | 0.0% | 0.0 |

The top panel of Table 2 shows the median earnings for the 12th grade cohort in 2000-04 by highest credential alongside the median earnings for the 9th grade cohort shown in Figure 12 for 2004-07. Because of the difference in the timing of leaving high school between the two cohorts, the earnings numbers for each cohort cover a comparable period—the first four years after leaving high school.

The differences in earnings shown in the third and fourth column of Table 2 indicate that the earnings in the comparable period are slightly lower for the 12th grade cohort than the 9th grade cohort. The differences are largest for students obtaining certificates, just below 10 percent, and next largest for students obtaining BAs, just under 6 percent. Overall, the differences are small enough to expect that the income growth observed for the 12th grade cohort in the subsequent four years will be about the same as the growth we cannot observe for the 9th grade cohort.

The middle panel of Table 2 shows the median earnings of the 12th grade cohort in the 2000-04 period alongside the median earnings in the 2004-07 period. The differences shown in the third and fourth columns indicate that earnings increase by about 40 percent for students with degrees, and by about 27 percent for students with certificates and students leaving college with no credentials. The considerably greater percentage increase in earnings is due in part to there being greater opportunities for advancement for students with degrees. They also are due to earnings

growing fastest immediately after leaving college. The students with degrees left school at or just before the start of the earliest period, while those with certificates and no degrees left up to three years earlier.

The bottom panel of Table 2 shows the difference in earnings in each period for students with successively higher degrees relative to students who left college with no credential. The panel shows that in the 2004-07 period, earnings of students with graduate degrees was about 74 percent higher than for students with no credentials; comparable differentials are 43 percent for students with BAs and about 20 percent for students with AA degrees and certificates. Relative to the 2000-04 period, the earnings increases are around 12 percentage points for students with degrees. In contrast, the relative earnings of students with certificates are unchanged; even though they remain close to 20 percent above those of students who left college without a degree.[15]

**The Effect of High School Preparation, College Concentration and Performance on Earnings**

The increases in earnings shown in Figure 12 and Table 2 associated with obtaining certificates, BAs, and graduate degrees are partly due to acquiring additional education and differences in the subjects studied (fields of concentration). However, some of the increases are due to differences in high school preparation and performance that would affect earnings even if students did not go to college.

In this section we show the results of a regression model that we used to measure the effect of differences in college course taking, high school preparation, and student characteristics. Table 3 describes the factors we take into account and figure 13 shows how each group of variables affects the earnings differences for members of the 9$^{th}$ grade cohort attending college. (Appendix 2 provides a more detailed explanation of the methodology for regression models, Appendix 3 contains descriptive statistics for all variables, and Appendix 4 displays the results for all regression models)

[15] In absolute terms, the earnings of students with AAs were about $2,000 below those of students with certificates in 2000-04 and about the same amount above those of students with certificates in 2004-07. As the next section suggests, one reason why the earnings of AA students are increasing at a faster rate than those of certificate students may be attributed to differences in unobserved student characteristics between the two groups. Another possible reason that the earnings of AA students increase by such large amounts between the two periods is that some attended colleges that are uncovered by our database and even obtained BAs in the 2000-04 period.

**Table 3: Factors Affecting Earnings Differentials Associated with Attaining Different Credentials**

**Control Variables**

- Student demographics (age. gender, race, ESL status, mental disabilities)
- Experience (Time between leaving school and quarter with highest earnings, number of quarters with earnings during high school, average earnings in high school, number of quarters with earnings while in college, highest quarterly earnings in college, number of quarters of post-college earnings)
- Geographic location (urban, suburban, rural and specific labor market)
- School characteristics (number of students, percent reaching grade 12, percent FRL, and percent Black and Hispanic)

**College Courses and Performance**

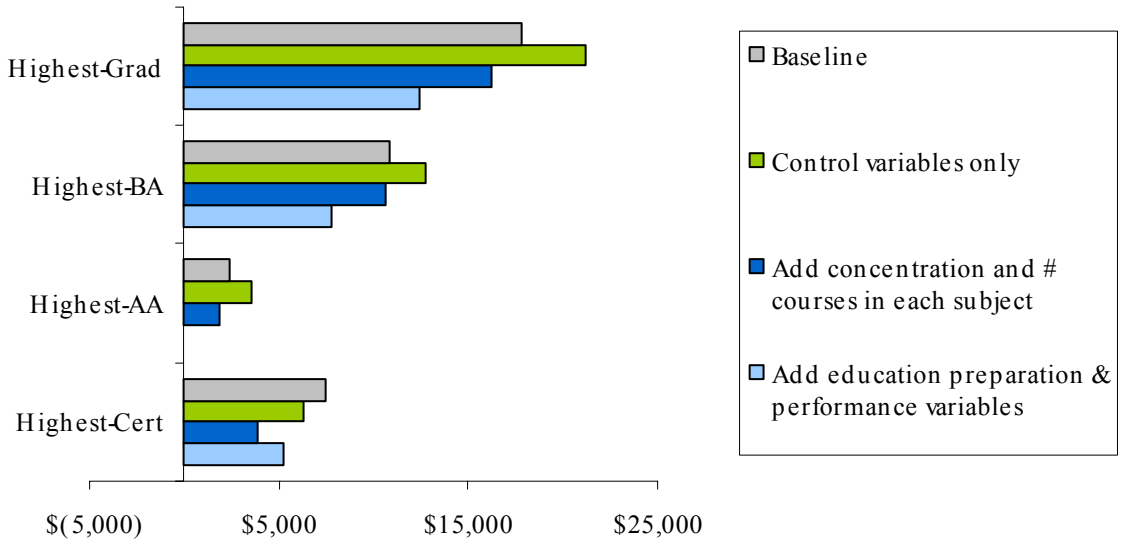
- Field of concentration
- Number of courses in each field:
  - Health-related, humanities, professional, social science, STEM, vocational, remedial, and other
- College GPA
- Percent of college courses that are remedial

**High School Preparation and Performance**

- High school GPA
- Completed Algebra II or higher
- Completed college preparatory curriculum
- Number of AP or IB courses in math and science
- Number of AP or IB courses in other subjects
- Number of dual enrollment courses in math and science
- Number of dual enrollment courses in other subjects

The regression model allows us to assess how much of the difference in earnings between students with each credential and students that attended college but did not attain a credential is associated with differences in characteristics that affect earnings (see Figure 13). Among students obtaining AAs, BAs, and graduate degrees, the pattern is similar: taking the control variables into account increases the earnings differences between students who receive degrees and other students; taking the number and type of college courses and college performance into account reduces the differences; and taking account of high school preparation and performance further reduces the differences.

**Figure 13: Regression adjusted difference in earnings between students with credentials and students without credentials**




Increases in the differences when a given set of characteristics is taken into account indicate that students attaining a given credential tend to have more characteristics associated with low earnings than students attending college but not receiving a credential. Thus, the increase associated with the control variables suggests that students obtaining credentials are more likely to work in labor markets with poorer economic opportunities or have less work experience than students who attended college but left without degrees.

Decreases in the differences when a given set of characteristics is taken into account indicate that students receiving a given credential have greater concentrations of characteristics associated with high earnings than students attending college but not receiving a credential. The decrease in differentials when we take into account the number of courses in different fields, the number and field of college courses taken, high school preparation, and college and high school performance (as measured by GPAs) suggest that students with degrees tend to concentrate in high-return fields, have high levels of preparation, and receive high grades. These factors account for almost all of the difference between students with AA degrees and students that attend college but do not receive credentials. However, after controlling for these factors there is still a significant difference in earnings between students with no credentials and those with BA degrees ($7,740) and graduate degrees ($12,456).

That controlling for observable differences reduces the earnings differences between college attendees with and without degrees is an important finding. It implies that high school preparation and differences in student motivation and ability that are difficult to measure directly have strong effects on attaining degrees in high return fields. Put another way, increasing college attendance, selecting high return courses, and earning a degree can have a substantial positive effect on earnings, but will be difficult to achieve for students with poor high school preparation and performance. Moreover, the effects of the increases are unlikely to be as large as those already observed because these positive changes are more likely to occur among students with poorer

preparation and performance than among students already entering college, taking high return courses, and obtaining degrees.

Students obtaining certificates likewise show a decrease in their earnings differentials when the number and field of college courses are taken into account. This is evidence that just as for degree students, selection of high return courses have significant positive effects on the earnings of students completing certificate programs.

But in distinct contrast to the results for students obtaining degrees, the differentials for students receiving certificates increase when educational preparation and performance are also taken into account. This is evidence that students successfully completing certificate programs tend not to be students with the best preparation and performance in high school or college. These results suggest that there are postsecondary pathways available to raise the earnings of students who did not perform especially well academically in high school.

Also in distinct contrast to the results for students obtaining degrees, the differentials for students receiving certificates increases when the control variables are taken into account. The increase associated with the control variables suggests that students obtaining credentials are more likely to work in labor markets with better economic opportunities and have more work experience than students who leave college without degrees. This may be an indication that employment opportunity and employer involvement have a positive effect on earnings in career-oriented fields.

**The Effect of Concentration on Differences in the Earnings of Students with Certificates and AA Degrees**

One of the most important findings illustrated by Figure 13 is that when all factors are taken into account, students with certificates show substantial earnings gains relative to students with similar characteristics who leave college without credentials, while students with AA degrees do not show any net gains in earnings. A key reason for the difference in earnings is that students with credentials are much more likely to take courses in high return fields than students who leave college with AAs. In this subsection, we describe in greater detail the impact of differences in the field of concentration on earnings.

Figure 14 shows how median earnings differ among students with certificates and AA degrees with different concentrations. The figure shows that earnings of students with concentrations in health-related fields are about $19,100 (42 percent) greater than students with concentrations in the humanities. The earnings differential between professional and humanities concentrations is about $8,400 (24 percent), and for voc-tech concentrations about $6,700 (20 percent). The differentials are considerably smaller for STEM concentrations, $4,100 (13 percent), and for social sciences $1,700 (6 percent).

These results clearly show that two-year college credentials in career-related, rather than academic, fields may have the potential to raise earnings. While not shown in the figure, the differentials are still significant when regressions are used to explicitly take into account differences in the high school preparation and performance of the students, their demographic characteristics, and the characteristics of their schools and labor markets.

**Figure14: Median of highest annual earnings after college by concentration for students whose highest credential is a certificate or AA.**

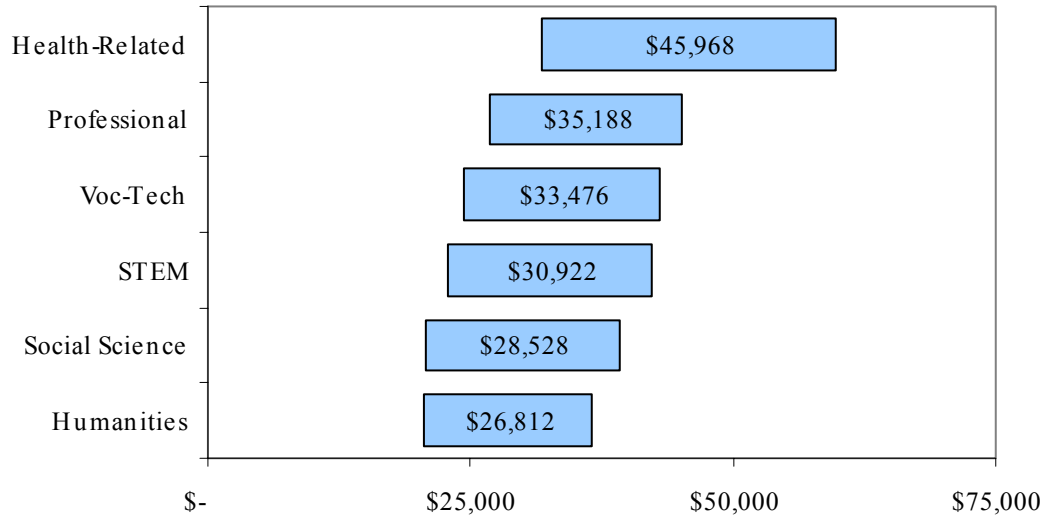
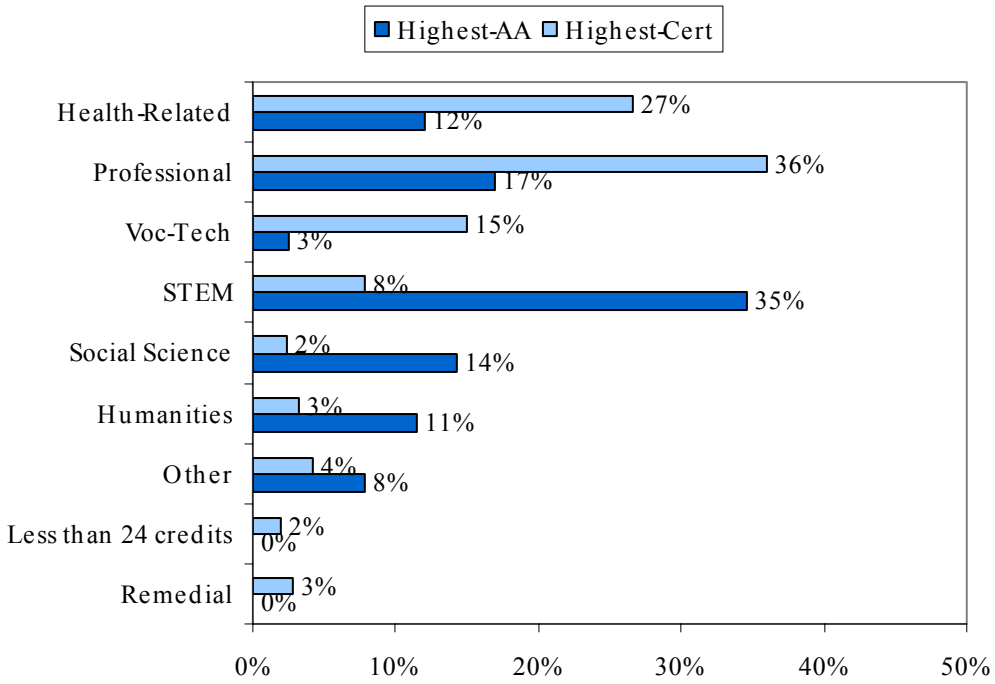



Figure 15 shows that certificate students are more likely to have concentrations in high return fields than low return fields and also are more likely than AA students to have concentrations in high return fields. Certificate students are about 2.5 times more likely to concentrate in health-related, professional, and voc-tech fields than AA students. Seventy-eight percent of certificate students concentrate in heath-related, professional, and voc-tech fields versus thirty-two percent of AA students. In contrast, AA students are 4.5 times more likely to concentrate in STEM, social science, or humanities than certificate students. Sixty percent of the AA students concentrate in STEM, social science, or humanities compared to 13 percent of the certificate students.

The 450 percent difference in the proportion of health-related, professional, and voc-tech concentrators with certificates versus AAs, coupled with the substantial (over 20 percent) difference in earnings associated with concentrating in those fields rather than the more academic fields, imply that the earnings of AA students would increase by $5,000 (16 percent) if they had the same distribution of concentrations as certificate students.

This result, coupled with the earlier finding that certificate students did not have the best high school preparation and performance is important. Together these two results suggest that it is feasible for students who attend two-year colleges and do not go on to complete four-year programs to increase their earnings substantially by completing the courses needed to obtain a certificate.

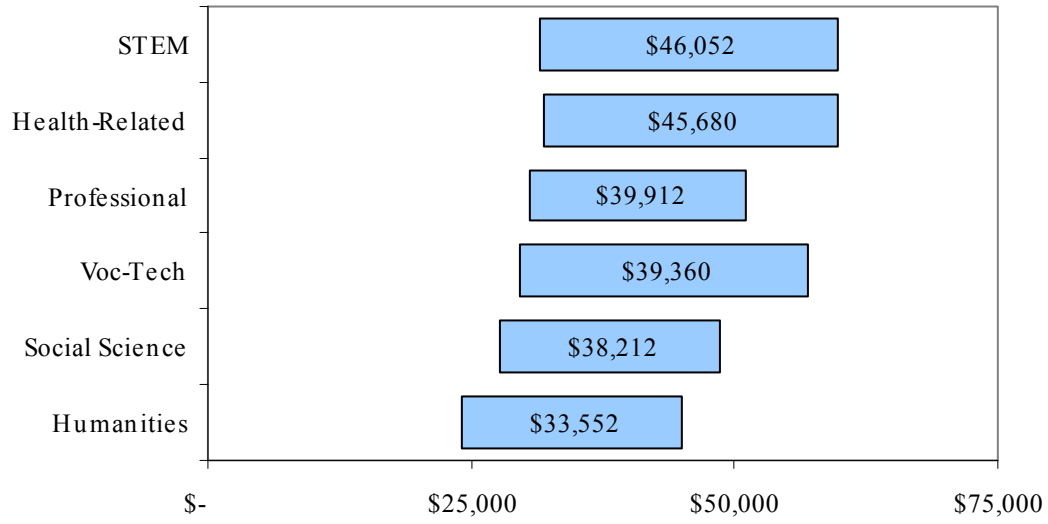
**Figure 15: Distribution of Choice of Concentration for Students with Certificates and Students with AA Degrees**




**The Effect of Field of Concentration on the Earnings of Students with BA Degrees**

Figure 16 shows how the median earnings of students who obtain BA degrees vary by field of concentration. The results differ from the analogous earnings statistics for students with certificates and AA degrees in several important ways. First, the earnings of BA students average about 20 percent above those of AA students (in part because BA students take about twice the number of courses as AA students). Second, the returns to some concentrations differ by small amounts or not at all between the two-year and four-year student groups, even though BA students complete about twice as many courses. For health-field concentrators the median earnings of students with two-year credentials are about the same as for students with BA degrees. For professional and voc-tech concentrators, median earnings for students with two-year credentials are only about 15 percent less than for students with BAs. Third, in sharp contrast, the returns to some concentrations are much greater for students with BAs than for students with two-year college credentials. Among STEM concentrators, the median earnings for those with BAs are about 50 percent greater than for those with two-year credentials. For social science concentrators the differential is about 34 percent, and for humanities concentrators the differential is about 25 percent.

**Figure 16: Median Earnings of Students with BA Degrees by Field of Concentration**




These results imply that it is not necessary to attend college for many years in order to substantially boost earnings as long as students take courses in career-oriented fields. At the same time, these results imply that it is necessary to attend college for many years and obtain at least a bachelor's degree in order to enter high-paying jobs with credentials in the more academically-oriented social science and humanities fields.

The 50 percent earnings increase associated with obtaining a BA in a STEM field versus only a STEM certificate or AA degree is especially interesting since it implies that employers are looking for students with a proven ability to complete upper-level courses in science, technology, engineering, and mathematics. The large earnings gains associated with STEM BAs versus STEM AAs create strong incentives for two-year students to determine if they have the potential to ultimately obtain STEM BAs. This may explain why 35 percent of AA students concentrate in STEM fields, which is twice the proportion concentrating in professional field, the next highest concentration

A key question is why more students with AAs in STEM fields do not continue on to obtain BAs. One possibility is that they lack the financial resources. However, an alternative possibility is that the terminal AA students feel that they would have difficulty completing upper level STEM courses. STEM concentrators starting at four-year colleges have GPAs of 4.00 compared to GPAs of 3.42 for students with terminal AAs.

## Summary

The analysis of earnings differences among members of our 9th grade cohort who reach the 12th grade; take at least one course at a Florida public college within two years of leaving high school; leave college by the end of 2005; and have earnings above the full-time minimum wage after leaving college indicates that:

- In general, attaining higher level credentials leads to substantially higher earnings relative to students who leave college without a credential:

- — Students with graduate degrees show median earnings that are greater by about $19,000 (62 percent).
- — Students with BA degrees show median earnings that are greater by about $12,600 (35 percent).
- — Students with certificates show median earnings that are greater by about $8,000 (27 percent).
- — But students with AA degrees show median earnings that are greater by only about $2,300 (8 percent).

- The magnitude of earnings gains varies substantially by field of concentration, but the effect differs between students with two-year versus four-year credentials, especially for STEM concentrators. Relative to students with two-year credentials with concentrations in the humanities (median earnings of $26,812), students with two-year credentials with concentrations in:
  - — Health-related fields show median earnings that are greater by about $19,100 (42 percent).
  - — Professional fields show median earnings that are greater by about $8,400 (24 percent).
  - — Voc-tech fields show median earnings that are greater by about $6,700 (20 percent).
  - — STEM fields show median earnings that are greater by about $4,100 (13 percent).
  - — Social science fields show median earnings that are greater by about $1,700 (6 percent).

- Over time, earnings tend to increase at a faster rate for students with BA and AA degrees relative to students with certificates and no credentials.
  - — During the time span from 8 years post-high school to 12 years post-high school, earnings increase an average of 41 percent for students with BA degrees, 39 percent for students with AA degrees, 26 percent for students with certificates, and 28 percent for students with some college but no credential.

- Among students with two-year credentials, certificate students are far more likely to concentrate in career-oriented fields which are associated with much higher returns than the more academically oriented fields.
  - — If AA students had the same distribution of concentrations as certificate students, their earnings would rise from $31,500 to $36,500, a 16 percent increase.

- Among students with concentrations in the humanities, students with BAs show median earnings that are greater by about $6,700 (25 percent) relative to the earnings of students with AAs.

- Relative to students with BAs with concentrations in the humanities, students with BAs with concentrations in:
  - — STEM fields show median earnings that are greater by about $12,700 (28 percent).
  - — Health-related fields show median earnings that are greater by about $11,900 (26 percent).
  - — Professional and voc-tech fields show median earnings that are greater by about $6,100 (15 percent).

— Social science fields show median earnings that are greater by about $4,600 (12 percent).

- Much of the earnings gain associated with credential attainment is related to completing more courses in different fields of concentration.

- For students receiving degrees, close to half of the difference is associated with better high school preparation and performance, better performance in college, not being mentally handicapped or an English language learner, and attending high schools with higher graduation rates located in areas with greater economic opportunity in the labor market.
    — This result implies that the earnings of students attaining degrees would be substantially above average even if they did not attain degrees or attend college.

- In distinct contrast, students receiving certificates did not have above-average high school preparation or performance nor did they attend high schools with above-average graduation rates or live in areas with better-than-average economic opportunity, and were more likely to be in disadvantaged groups.
    — This result suggests that attainment of a certificate, especially in career-oriented fields, offers a pathway to substantially increase earnings that is open to lower performing high school students.

# The Effect of Student Preparation and Performance on Postsecondary Outcomes

The next step after identifying concentrations and credentials with high returns is to determine what it takes for students to be successful in each program. This section examines how student preparation and performance influence three postsecondary outcomes:

1. Persistence – likelihood of completing 24 or more credit hours (equivalent to at least one year of full-time courses) for students attending a postsecondary institution within two years of high school.
2. Choice of concentration – likelihood of completing the most courses in health-related, humanities, professional, remedial, social science, STEM, Voc/Tech, or other fields for students attending a postsecondary institution within two years of high school who completed at least 24 credit hours.
3. Attainment of a credential – likelihood of receiving any postsecondary credential within six years of high school. Separate models are estimated for all students attending a postsecondary institution within two years of high school and only those that completed at least 24 credit hours.

For each of these outcomes we estimate multivariate logistic regression models that include the following variables related to student preparation and performance:

- High school factors
    - High school GPA
    - Whether the student completed Algebra II or higher
    - Whether the student completed a college preparatory curriculum
    - Total number of AP/IB/Dual enrollment courses taken in high school
- College factors

- College GPA
- Percent of college courses that were remedial

We also include control variables in each model for race, gender, FRL status, school locale,[16] and college attended.

In order to provide a meaningful interpretation of the regression results we examine how the likelihood of each postsecondary outcome differs for hypothetical "A", "B", and "C" students. We create these estimates by calculating the predicted probability of each outcome in the regression models for students with high school GPAs in the "A", "B", and "C or below" categories. Table 4 shows the average values for each of the indicators of student preparation and performance among these three groups of students. It is important to note that not only do "A" students receive higher grades; but they also have higher levels of preparation and performance on all of the other indicators. For example, the "A" students completed an average of 2.3 AP/IB/Dual enrollment courses in high school compared to an average of 0.2 courses for the "C" students. Thus the likelihood of each outcome for students in these three hypothetical groups represents differences associated with the varying levels of student preparation and performance on a number of indicators.

**Table 4: Average values for student preparation and performance indicators among three hypothetical groups of students**

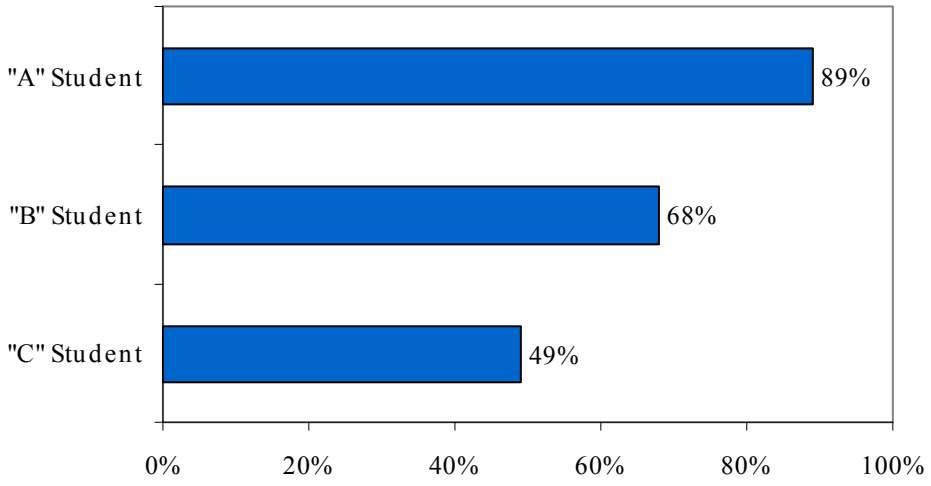
| | "A" student | "B" student | "C" student |
|---|---|---|---|
| High school GPA | 4.4 | 3.5 | 2.6 |
| % Taking Alg II or higher | 96% | 73% | 45% |
| % Taking a college prep curriculum | 72% | 55% | 29% |
| Total AP/ IB/ Dual courses | 2.3 | 0.6 | 0.2 |
| College GPA | 3.9 | 2.9 | 2.4 |
| % of college courses that were remedial | 4% | 19% | 35% |

**Postsecondary Persistence**

As illustrated in Figure 17, student preparation and performance are very important predictors of postsecondary persistence—the likelihood of completing 24 or more credit hours for students attending a postsecondary institution within two years of high school (see Appendix 4 for the full results of all logistic regression models of postsecondary outcomes). The likelihood of completing one full year of courses is 89 percent for "A" students compared to only 49 percent for "C" students.

[16] School locale includes large cities, mid-size cities, urban fringe of large cities, urban fringe of mid-size cities, large towns, small towns, and rural areas. Definitions for each category are based on Census designations.

**Figure 17: Likelihood of completing 24 or more credit hours, by three hypothetical groups of students**

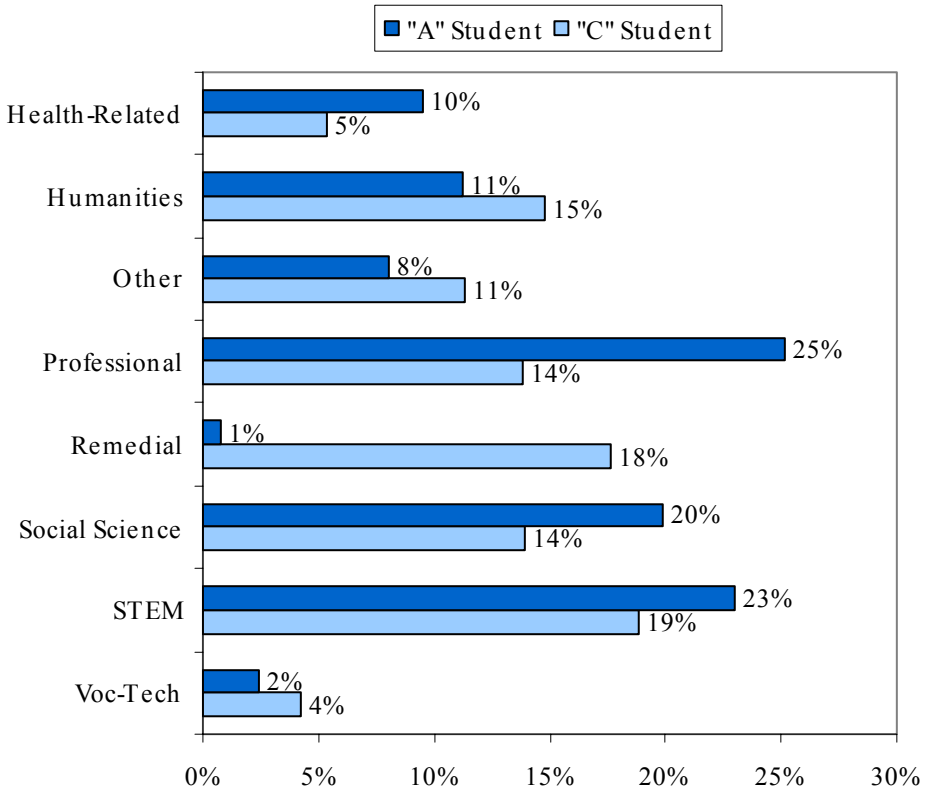



## Choice of Concentration

Among the students that completed at least 24 credit hours, we estimate the likelihood of selecting each of the eight fields of concentration. A key finding in figure 18 is that a high proportion of "C" students were limited to taking remedial courses (18 percent versus 1 percent for "A" students).[17] A second key finding is that "A" students are about twice as likely to concentrate in high-return fields. For example 25 percent of "A" students have concentrations in the professional field versus 14 percent of "C" students; and 10 percent of "A" students concentrate in health-related fields compared to 5 percent of "C" students.

[17] This result suggests a bifurcation of the C students into those that are really not prepared (or perhaps capable) and those that did not apply themselves.

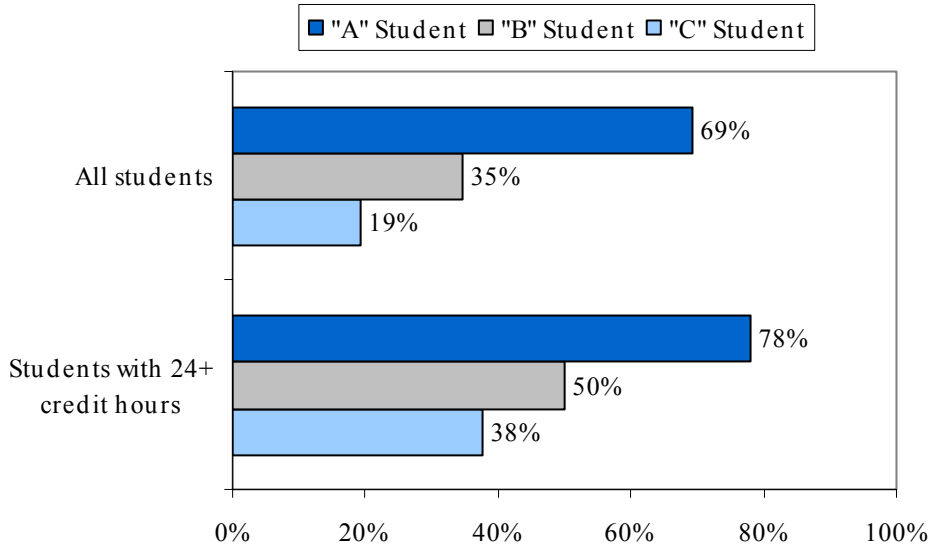
**Figure 18: Likelihood of selecting each concentration for hypothetical "A" students and "C" students**




## Attainment of a Credential

Lastly, we compare the likelihood of attaining any postsecondary credential for the three hypothetical groups of students (see Figure 19). Among all students attending college within two years of high school, the likelihood of receiving a credential is 69 percent for "A" students compared to only 19 percent of "C" students. When we limit the analysis to only those students who completed at least 24 credit hours, the likelihood of attaining a credential increases to 78 percent for "A" students and 38 percent for "C" students. These results suggest that "C" students are unlikely to receive any credential, even if they are able to make it beyond the first year of college.

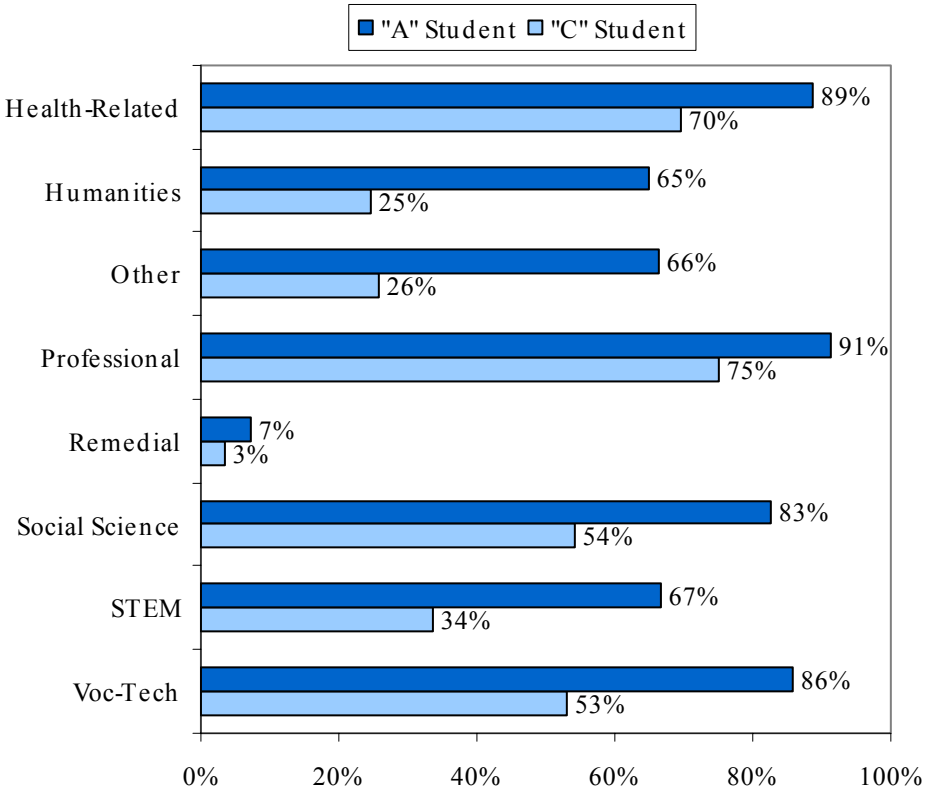
**Figure 19: Likelihood of attaining any credential, by three hypothetical groups of students**




When we examine the likelihood of attaining a credential by field of concentration for students that completed at least 24 credit hours, considerable differences emerge (see Figure 20). Even though fewer than 2 out of 5 "C" students complete a credential, the likelihood ranges from 25 percent for "C" students in the humanities to 75 percent for "C" students in professional concentrations. In fact, "C" students in professional and health-related concentrations are more likely to attain a credential than "A" students in humanities or STEM concentrations.

The range of likelihood values across concentrations is smaller for the group of "A" students than "C" students. However, there are still substantial differences, with a 65 percent likelihood of attaining a credential for "A" students in humanities compared with a 91 percent likelihood for "A" students in professional concentrations. Further research is needed to determine why the difference in credential completion is so great among students with similar levels of preparation and performance. Some concentrations may be more effective at imparting real-world skills that students find relevant, or there may be differences in the rigor of the requirements needed to attain a credential. Yet it is also important to consider that part of this difference may be attributed to selection bias if the most motivated students self-select into the most lucrative fields such as professional and health-related concentrations.

**Figure 20: Likelihood of attaining a credential for hypothetical "A" students and "C" students with 24+ credits, by field of concentration**




Differences in the likelihood of attaining a credential among the hypothetical student groups are even greater among the more advanced types of credentials. As indicated in Table 5, the likelihood of attaining an AA degree or higher for students that complete at least 24 credit hours is 77 percent for "A" students compared with 30 percent for "C" students. At the credential level of BA or higher, the likelihood is 59 percent for A students relative to only 14 percent for C students. This means that "A" students are more than four times more likely to receive BA or higher than "C" students. Field of concentration remains a significant predictor of the likelihood of attaining an advanced credential. For example, among "C" students the likelihood of receiving a BA or higher ranges from 37 percent in professional concentrations to 5 percent for STEM concentrations.

**Table 5: Likelihood of attaining a credential, by type of credential and hypothetical student group**

| Type of Credential: | Any Credential | | | AA or Higher | | | BA or Higher | | |
|---|---|---|---|---|---|---|---|---|---|
| Hypothetical Student Group: | "A" | "B" | "C" | "A" | "B" | "C" | "A" | "B" | "C" |
| Health-Related | 89% | 77% | 70% | 83% | 53% | 38% | 59% | 23% | 15% |
| Humanities | 65% | 34% | 25% | 64% | 33% | 23% | 45% | 15% | 10% |
| Professional | 91% | 78% | 75% | 90% | 68% | 54% | 80% | 48% | 37% |
| Remedial | 7% | 4% | 3% | 7% | 2% | 0% | N/A | N/A | N/A |
| Social Science | 83% | 62% | 54% | 82% | 62% | 53% | 71% | 42% | 35% |
| STEM | 67% | 42% | 34% | 66% | 40% | 32% | 38% | 8% | 5% |
| Voc/ Tech | 86% | 66% | 53% | 79% | 37% | 20% | 64% | 20% | 9% |
| Other | 66% | 36% | 26% | 66% | 33% | 22% | 50% | 17% | 9% |
| Students with 24+ credit hours | 78% | 50% | 38% | 77% | 44% | 30% | 59% | 23% | 14% |
| All students | 69% | 35% | 19% | 68% | 31% | 15% | 52% | 16% | 7% |

**Summary**

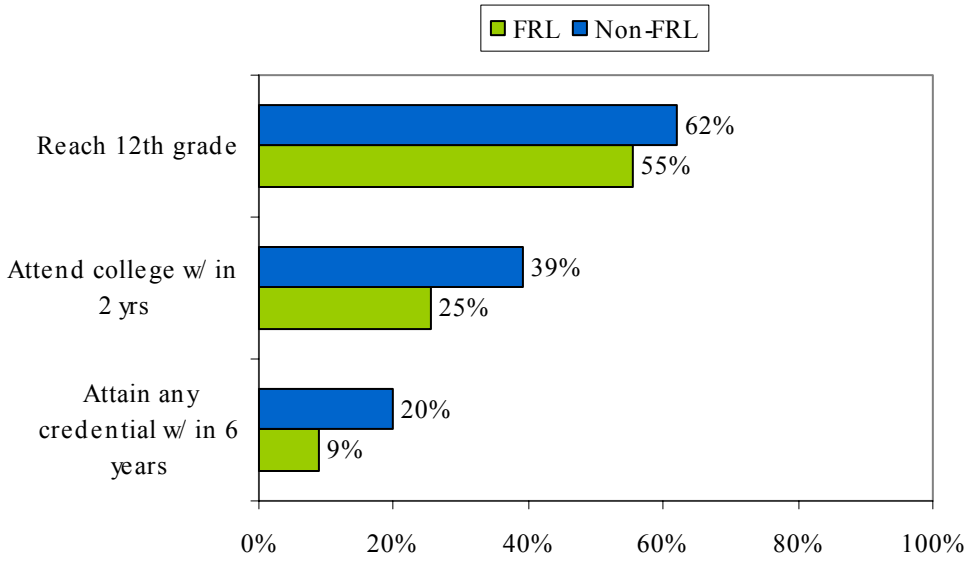
After examining differences in postsecondary outcomes among students with different levels of preparation and performance, we find that:

- Student preparation and performance are important predictors of persistence and the attainment of a credential.
  - The likelihood of completing at least one year of college is nearly twice as great for "A" students than for "C" students.
  - The likelihood of attaining a postsecondary credential is more than three times greater for "A" students than "C" students.
- Students with strong performance in high school and college have high probabilities of completing programs in every field, but especially in high-return concentrations.
  - "A" students with 24+ credits have over an 85 percent probability of attaining a credential in the three career-oriented concentrations - health-related, professional, and voc-tech fields.
  - "A" students with 24+ credits have a 67 percent probability of attaining a credential in a STEM field, which is the highest return field at the BA level.
  - "A" students with 24+ credits also have close to a 67 percent probability of attaining a credential in the remaining two academic-oriented concentrations—social science and humanities.
  - "C" students are much more likely than "A" students to be limited to concentrating their courses in remedial subjects (18 percent versus 1 percent).
- Students with weak performance in high school have low probabilities of attaining a credential.
  - Only one in five "C" students and one in three "B" students obtain a credential, compared to seven of ten "A students.
- Students with weak performance in high school have high probabilities of attaining a credential in career-oriented high-return fields if they can obtain 24+ credits, even if the probabilities are lower than for high performing high school students.
  - The likelihood of attaining a credential is about 72 percent for "C" students in professional and health-related concentrations compared to about 90 percent for "A" students.
  - In contrast, the likelihood of attaining a credential is about 34 percent for "C" STEM students compared to 67 percent for "A" STEM students.

# Differences by FRL Status in Postsecondary Outcomes and Earnings

When we examine differences in the educational pipeline by FRL status, we find that there always is a gap in favor of non-FRL students and the gap grows as students progress from one milestone to the next in the education pipeline (see Figure 21). Sixty-two percent of non-FRL students reach grade 12 compared to 55 percent of FRL students. At the next milestone we see that college attendance rates are 39 percent for non-FRL students versus 25 percent for FRL students. The greatest difference between the two groups occurs at the credential-attainment stage, with over twice as many non-FRL students earning credential within six years of high school than FRL students (20 percent and 9 percent, respectively).

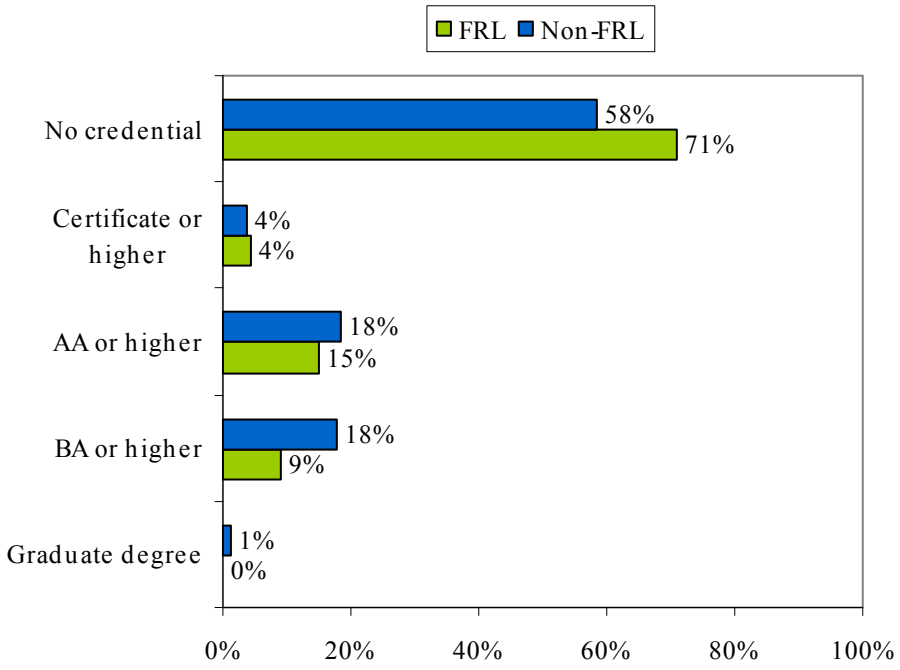
**Figure 21: Educational pipeline by FRL status**




**Gap in Credential Attainment at Two-Year Colleges**

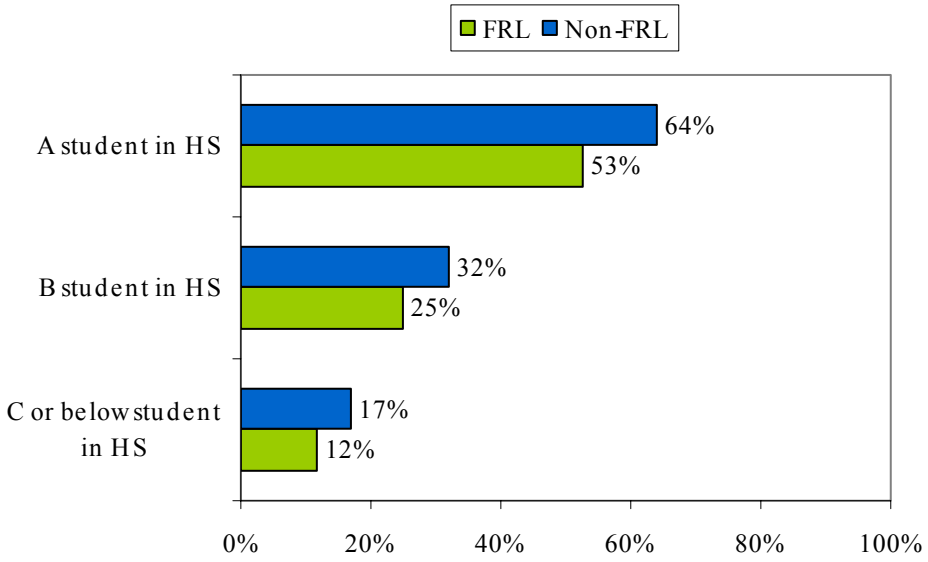
Even after we disaggregate students according to the type of institution attended (two-year or four-year), there are still substantial differences in credential completion rates by FRL status. Seventy-one percent of non-FRL students that start at a two-year college attain a credential, compared to only 58 percent of FRL students (see Figure 22). A similar percentage of students from both groups attain credentials, but non-FRL students are slightly more likely to complete an AA degree (18 percent versus 15 percent) and twice as likely to transfer to a four-year college to receive a BA degree (18 percent versus 9 percent).

**Figure 22: Highest degree for students that start at a two-year college, by FRL status**




Among students attending 2-year colleges, 36 percent of non-FRL students were A students in high school relative to 22% of FRL students. The gap in credential attainment by FRL status is reduced when comparing students that started at a two-year college with similar high school GPAs (see Figure 23). Over half of the FRL (53 percent) and non-FRL students (64 percent) with an A GPA in high school attained a postsecondary credential. Conversely, only 12 percent of FRL students and 17 percent of non-FRL students with a C or below GPA in high school attained a postsecondary credential.

**Figure 23: Percent of students starting at a two-year college receiving any credential, by FRL status and high school GPA**

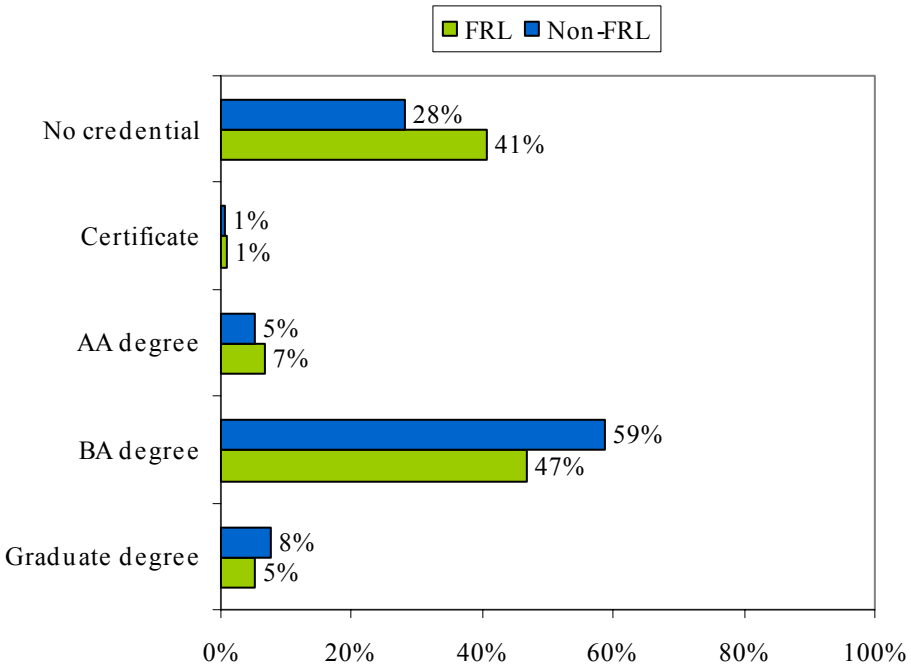


Among all students starting at a two-year college, there is a gap of 13 percentage points for credential attainment by FRL status. In order to examine how much of the gap may be attributed to differences in students' high school performance, we estimate how the percentage of FRL students receiving a credential would change if this group had the same high school GPA distribution as non-FRL students.[18] Our results suggest that if both groups had similar GPAs, the number of FRL students receiving a credential would increase from 29 percent to 33 percent. The FRL gap in attaining a credential among students starting at a two-year college would be reduced from 13 percentage points to 9 percentage points. Thus even though differences in high school GPA account for some of the difference between the two groups, the majority of the gap remains unexplained.

**Gap in Credential Attainment at four-year Colleges**

There is also a 13-point gap in credential attainment by FRL status at four-year colleges (see Figure 24). Only 28 percent of FRL students at four-year colleges receive a credential within six years, compared to 41 percent for Non-FRL students. The largest gap occurs among BA recipients with 47 percent of FRL students at four-year colleges receiving BA degrees versus 59 percent of non-FRL students. Non-FRL students were also less likely to complete the requirement for a graduate degree (5 percent versus 8 percent).

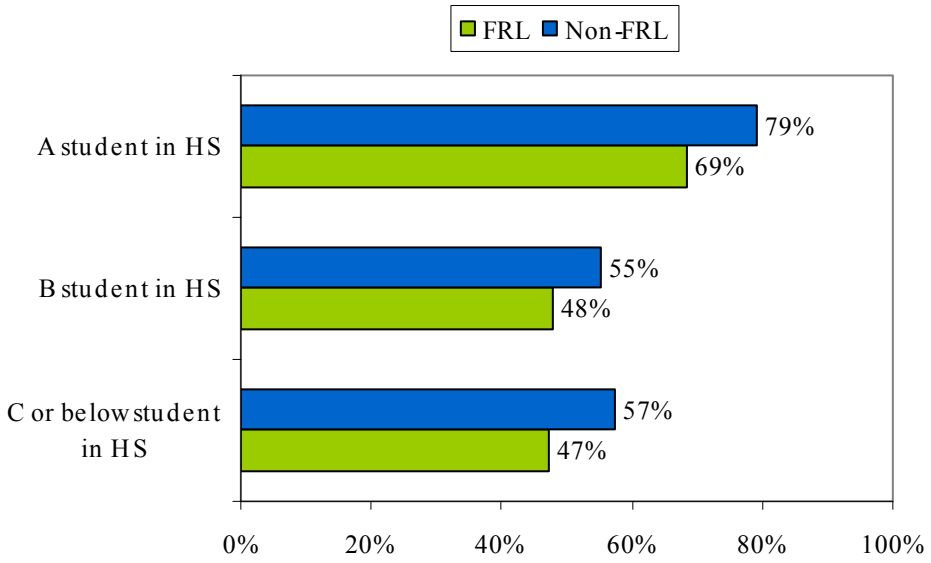
**Figure 24: Percent of students starting at a four-year college receiving any credential, by FRL status and high school GPA**




[18] Estimates for how much of the FRL gap in credential attainment may be attributed to differences in students' high school performance are calculated using the following three steps: 1) Calculate the average earnings for FRL students in each credential category. 2) Calculate the percentage of non-FRL students in each credential category. 3) Multiply the average earnings for FRL students in each credential category by the percentage of non-FRL students in each category.

Almost 70 percent of non-FRL students attending four-year colleges had an A GPA in high school relative to 56 percent of FRL students. Figure 25 indicates that the FRL gap in credential attainment is reduced when comparing students with similar high school GPAs. However, the differences in credential attainment by high school GPA category are much smaller for students at four-year colleges than two-year colleges. The percentage of students receiving a credential is similar for B students in high school and C or below students in high school.

**Figure 25: Percent of students starting at a four-year college receiving any credential, by FRL status and high school GPA**

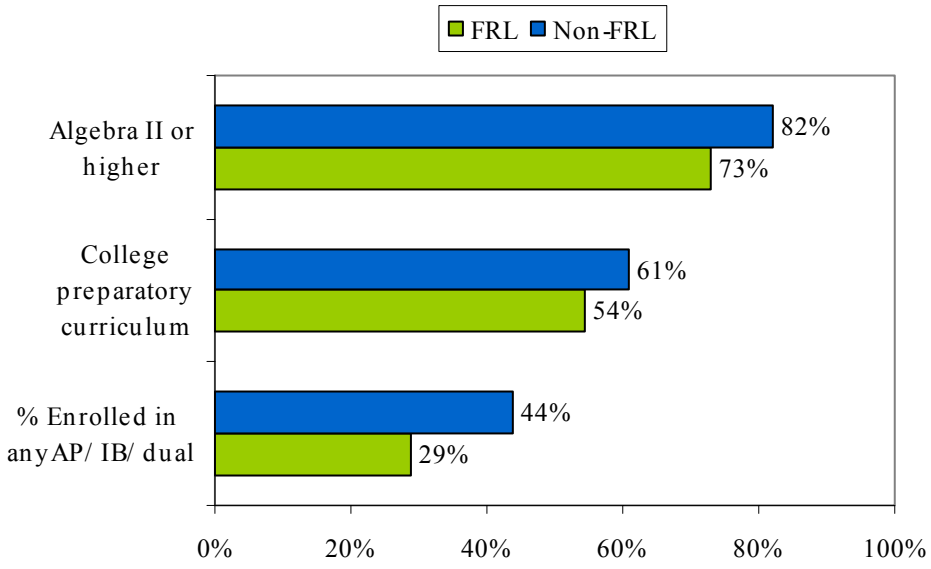



We also estimated how much the FRL gap in credential attainment among students at four-year colleges would be reduced if FRL and non-FRL students had a similar distribution of high school GPAs. The results indicate that the number of FRL students receiving a credential would increase from 59 percent to 62 percent. The effect of equalizing the GPA distribution would be similar to the results at the two-year college level with a reduction in the FRL credential attainment gap from 13 percentage points to 3 percentage points.

### Differences in High School Preparation and College Experiences by FRL Status

The previous sections indicate that a FRL gap in credential rates of approximately 10 percentage points remains after accounting for differences in the type of institution attend and high school GPA among the two groups. As a result, we decided to examine difference in other factors related to high school preparation and college experiences by FRL status. Figure 26 shows that FRL students have lower levels of high school preparation on three indicators relative to non-FRL students. First, 73 percent of FRL students complete Algebra II or higher in high school compared to 82 percent of non-FRL students. In addition, FRL students are less likely to complete a college preparatory curriculum (54 percent versus 61 percent) and less likely to participate in AP/IB/Dual enrollment courses (29 percent versus 44 percent).

**Figure 26: Differences in high school preparation by FRL status**




FRL and non-FRL students also differ on a number of indicators related to the college experience (see Table 6). In terms of academic performance, FRL students are more likely to have college GPAs in the C or below category (40 percent versus 28 percent). They are also more likely to enroll in remedial courses in college (62 percent versus 40 percent). College attendance patterns differ between the two groups, with FRL students more likely to start their postsecondary education at a two-year college (80 percent versus 70 percent) and also more likely to attend only one postsecondary institution (62 percent versus 48 percent). In addition, there is an 11 percentage point difference in college enrollment intensity, with FRL students being more likely to enroll part-time.

**Table 6: Differences in college experiences by FRL status**

| | Non-FRL | FRL | Difference |
|---|---|---|---|
| College GPA | | | |
| A | 36% | 25% | 11% |
| B | 37% | 35% | 1% |
| C or below | 28% | 40% | -13% |
| | | | |
| Participation in remedial courses | | | |
| % Enrolled in any remedial courses | 40% | 62% | -22% |
| | | | |
| Type of post-secondary institution | | | |
| Started at a two-year college | 70% | 80% | -11% |
| Started at a four-year college | 30% | 20% | 11% |
| | | | |
| Number of institutions attended | | | |
| 1 institution | 48% | 62% | -14% |

| | Non-FRL | FRL | Difference |
|---|---|---|---|
| 2 institutions | 36% | 29% | 7% |
| 3 or more institutions | 16% | 9% | 7% |
| | | | |
| Enrollment status in fall and spring terms | | | |
| Only or predominately full-time | 66% | 58% | 8% |
| Only or predominately part-time | 34% | 42% | -8% |

**Differences in College Persistence and Choice of Concentration by FRL Status**

Figure 27 illustrates differences in college persistence by FRL status. Approximately three-quarters of non-FRL students complete at least 24 credit hours in college compared to about two-thirds of FRL students. This also means that FRL students are more likely to leave college before deciding on a field of concentration.

**Figure 27: Percent of students completing 24 credits, by FRL status**

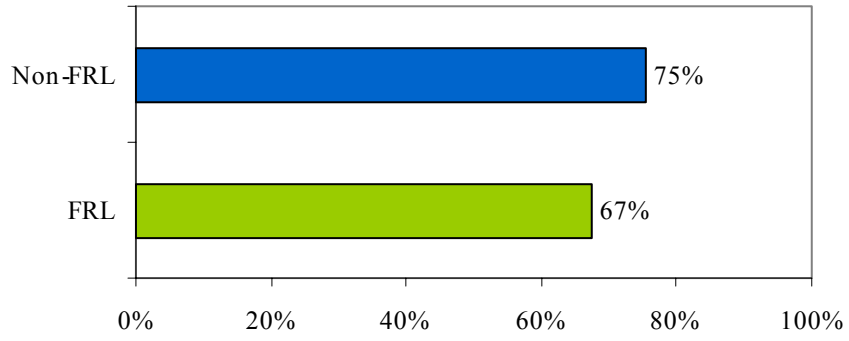
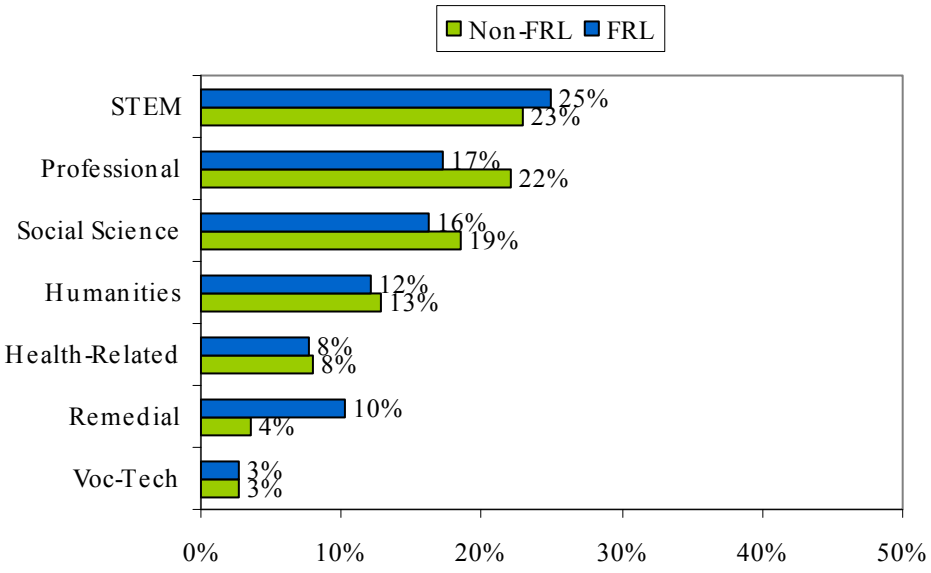



Figure 28 shows how the choice of concentration differs by FRL status for students that complete at least 24 credit hours. Overall, the percentage of students in each field of concentration is similar within the two groups. The greatest difference is in the remedial category where FRL students are more than twice as likely as non-FRL students to take courses in remedial subjects (4 percent versus 11 percent). Among the most lucrative fields, FRL students are less likely to concentrate in a professional field (17 percent versus 22 percent), but equally likely to concentrate in a health-related field (8 percent for both groups). For both groups the most common field of concentration was STEM (approximately one quarter of students) and the least common field of concentration was Voc/Tech (3 percent).

**Figure 28: Choice of concentration, by FRL status**

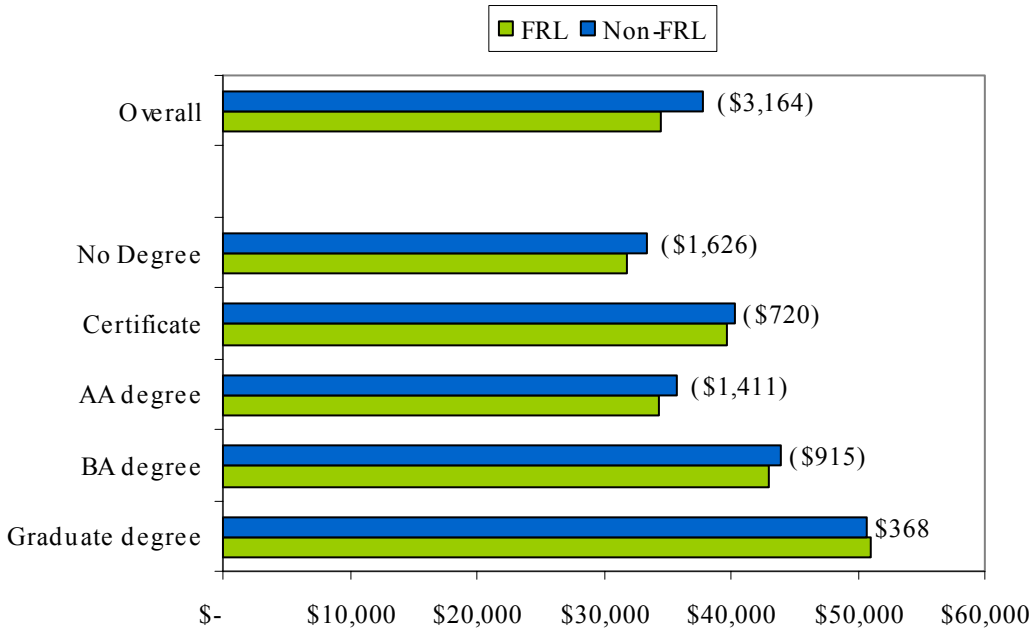



**Differences in Post-College Earnings by FRL Status**

Last, we examine the difference in post-college earnings by FRL status (see Figure 29). Among all students attending college, FRL students earn $3,164 less per year than non-FRL students, on average. However, when we examine the FRL gap in earnings between students with the same type of credential, the differences are relatively small considering that FRL students have weaker preparation and performance. In fact, the earnings gap is reduced at each level of credential attainment until the highest level of graduate degrees where FRL students earn an average of $368 more per year than non-FRL students.

We estimate how the earnings gap by FRL status would be expected to change if FRL students had the same credential distribution as non-FRL students. We find that the earnings for FRL students would be expected to increase from $34,563 to $36,442. This means that the FRL gap in earnings would be reduced from $3,164 to $1,285.

**Figure 29: Highest annual non-zero, full-time, post-college earnings for students attending college, by highest degree and FRL status**




## Summary

We examined differences in postsecondary outcomes and earnings by FRL status and found that:

- FRL students are much less likely to attend college than non-FRLs
  - 25 percent FRL versus 39 percent non-FRL
- FRL students are much less likely to obtain a credential than non-FRL students
  - 9 percent FRL versus 20 percent non-FRL
- A small amount of the FRL gap in credential attainment is attributed to differences in the distribution of high school GPAs between the two groups.
- Overall, the distribution of concentrations is similar by FRL status, although FRL students are more likely to concentrate their courses in remedial subject.
- FRL students have 8.4 percent lower post-college earnings than non-FRL students.
  - $34,563 for FRL versus $37,727 for Non-FRL
- Much of the FRL gap in post-college earnings (approximately 60%) is due to differences in the type of credential received.

# Conclusions and Policy Implications

This study has followed a cohort of 144,545 Florida public school students who entered the 9th grade in 1996 through high school into and out of postsecondary education and into the workforce. In particular, we used this cohort to examine the effect of high school course selection and grades on postsecondary attainment and the effect of postsecondary on earnings. To better assess the long-term earnings impacts of postsecondary course selection, persistence, and obtaining a credential we also followed a cohort of students who entered the 11th grade in 1995. The earnings of this group could be followed for 12 years after leaving high school, an increase of four key years over the period covered by the 9th grade cohort

The following subsections describe our major findings. We then discuss the implications of these findings in two areas of major interest to the Gates Foundation:

1. Increasing attainment of four-year degrees by low-income students

2. Increasing attainment of certificates from two-year colleges by low-income students.

**Differences in Post-College Earnings by Type of Credential and Concentration**

On average, higher levels of postsecondary degrees are associated with higher post-college earnings. This is largely attributed to the greater number of postsecondary courses required to earn more advanced credentials. One important exception is that students who complete certificates from two-year colleges have about the same median earnings as students who complete AA degrees.

Certificates also are the only credential where controlling for high school preparation and performance *increases* the gap in earnings between college attendees with and without credentials. This implies that obtaining a certificate significantly increases the earnings of low-performing high school students relative to students with similar records who attend college but do not obtain a credential. In contrast, strong positive earnings effects of obtaining AA, BA, and graduate degrees were largely confined to high-performing high school students.

Among students with credentials from two-year colleges, the median post-college earnings varied by as much as 42 percent among the different fields of concentration. Professional and health-related concentrations were associated with the highest earnings, while academic concentrations such as humanities and social sciences were associated with the lowest earnings. However, there also was considerable overlap in earnings among each of the fields of concentration. This implies, for example, that some humanities concentrators were able to earn more than some health field concentrators

There was less variation among the median earnings by concentration among students who received credentials from four-year colleges. For this group, the differential in earnings between the fields with the highest and lowest returns was only 28 percent. Students with concentrations in STEM had the highest post-college earnings, closely followed by students in health-related, and then by students with professional concentrations. Similar to the results at two-year colleges, social science and humanities concentrations had the lowest median earnings.

**The Effect of High School Preparation and Performance on Postsecondary Outcomes and Future Earnings**

One of our primary findings relates to the extent to which high school preparation and performance influence postsecondary outcomes and future earnings. The percentage of 12th graders in the 9th grade cohort attending college ranged from 79 percent for students with an A high school GPA to 39 percent for C or below students. Students with A GPAs were also six times more likely to attend a four-year college (either directly or by transferring from a two-year to a four-year college) than C or below students.

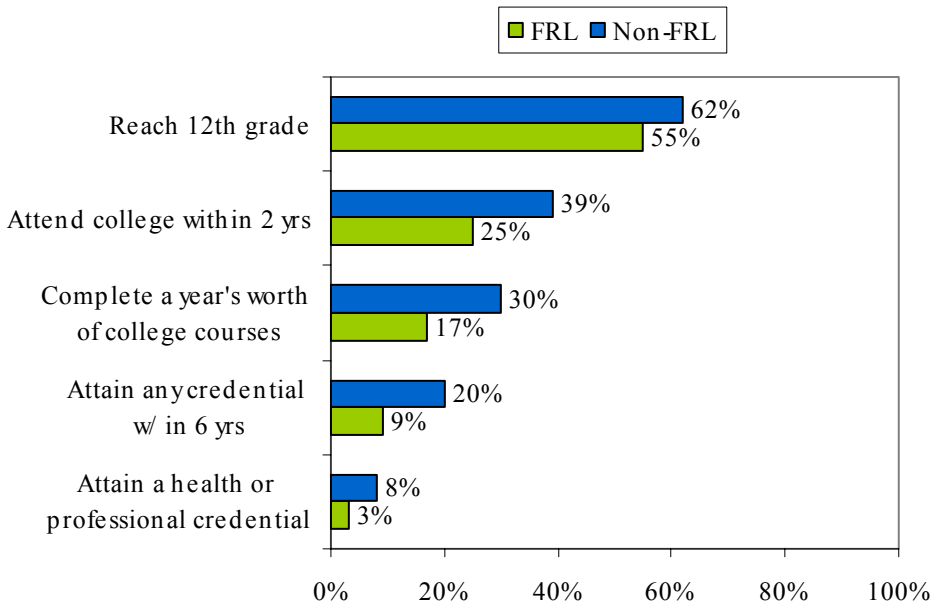
Students with high GPAs also tended to be better prepared for postsecondary education, as they were more likely to take Algebra II or higher in high school, complete a college preparatory curriculum, and participate in AP/IB or dual enrollment programs. High performing students in high school who continued to postsecondary education were very likely to persist beyond the first year. They were most likely to select a concentration that is associated with high earnings after college, such as professional fields. In addition, they had a high probability of attaining a postsecondary credential within six years.

Low-performing high school students who went on to postsecondary education were unlikely to remain in college for more than a year. Furthermore, the overall likelihood of attaining a postsecondary credential for this group was only 19 percent. Many of the students who did persist beyond the first year concentrated their courses in remedial subjects or academic concentrations that tend to have low post-college returns. A small proportion of low performing high school students concentrated their courses in career-oriented, rather than academically-oriented, areas—voc-tech, professional, and health-related fields. These students had high probabilities of attaining credentials in these career-oriented fields, although the probabilities were lower than for high-performing high school students. Thus, voc-tech, professional, and health-related programs may offer an opportunity for low-performing high school students to substantially increase their earnings

**Differences in Postsecondary Outcomes and Future Earnings by Family Income**

Six years after high school, free and reduced priced lunch (FRL) students' earnings were about 10 percent less than those of other students. The earnings for FRL students were $31,600 on average, compared to $34,705 for non-FRL students. Close to 40 percent of this gap in earnings is attributed to differences in high school completion, college attendance and persistence, choice of concentration, and postsecondary credential attainment (see Figure 30). Non-FRL students are more than twice as likely to attain a credential as FRL students, and the differential is even larger in high-return fields such as professional or health-related credentials.

**Figure 30: Percent of students at various educational milestones, by FRL status**




The gap in earnings by FRL status would be reduced by 37 percent if FRLs had the same percentage of students as non-FRLs who completed high school, attended college, persisted beyond the first year of college, selected each field of concentration, and attained postsecondary credentials. Table 7 estimates how the earnings gap would be reduced if each educational milestone could be equalized among FRL and non-FRL students. Equalizing the credential attainment rates between the two groups would contribute the most to reducing the earnings gap.

**Table 7: The predicted effect on the FRL earning gap of sequentially equalizing educational milestones**

| Sequentially equalize: | Reduction in gap | Contribution to total reduction |
|---|---|---|
| Reaching 12th grade | $321 | 27% |
| Attending college | $285 | 24% |
| Completing 24+ credits | $93 | 8% |
| Concentrating in same fields | $127 | 11% |
| Obtaining credentials | $364 | 31% |
| Total reduction in gap | $1,190 | |

**Policy Implications**

In this subsection we first review the empirical results that point to there being substantial potential for raising the earnings of low-income students in two ways: (1) increasing attainment of four-year degrees by high-performing low-income students; and (2) increasing attainment of certificates from two-year colleges by low-performing low-income students. We then discuss

ways to remove key impediments to increase the number of low-income students pursuing the two options.

**Evidence related to Area-1: Increasing the Attainment of Four-Year Degrees**

- High school preparation and performance have a powerful effect on attaining degrees at four-year colleges.
    - — Students with A high school GPAs are highly likely to obtain BAs when they directly enter four-year colleges or transfer into four-year colleges after obtaining an AA degree at a two-year college.
    - — High school students with C GPAs who enter college are likely to leave without obtaining a credential.
- Remaining in college long enough to obtain successively higher college credentials has powerful effects on earnings. The biggest gains are associated with obtaining a graduate degree and a BA degree.
- Large proportions of students who do well at two-year colleges transfer to four-year colleges and obtain BA and graduate degrees.

**Evidence related to Area-2: Increasing the Attainment of Certificates.**

- High school preparation and performance have much less powerful effects on attaining certificates at two-year colleges than obtaining degrees at two-year and four-year colleges.
    - — Students with C high school GPAs are capable of obtaining certificates in career-oriented fields (health-related, professional, and voc-tech), even though they are less likely to obtain certificates than students with higher GPAs.
- Students with C high school GPAs who enter two-year college are likely to leave without obtaining a degree, especially if they take remedial courses as a prerequisite to pursuing academic courses required for an AA degree.
- The selection of field of concentration has a powerful effect on earnings and obtaining a credential of two-year students. Among two-year college students who do not later transfer to four-year colleges:
    - — Concentrating in health-related fields increases earnings by over 40 percent relative to students who concentrate in humanities.
    - — Concentrating in professional and voc-tech fields raise earnings by more than 20 percent.
    - — Concentrating in academic fields including STEM has smaller earnings effects than concentration in career-oriented fields.

**Policy Options to Increase Attainment of Degrees and Certificates**

There are five major types of impediments that potentially need to be overcome in order to increase attainment of credentials. Four potential impediments that affect students' decisions are:

Financial—lack of the funds needed to pay the direct costs of postsecondary programs—tuition, fees, books, living expenses, and transportation; as well as the indirect cost of foregone earnings students need to support themselves and their families.

Informational—lack of information about: (a) returns from obtaining different credentials and taking courses in different fields; (b) the nonpecuniary characteristics of jobs in different fields; (c) the likelihood a student would complete a specific course of study given his or her academic

performance and non-academic skills; (d) which schools offer the most appropriate courses; and (e) the costs of completing different programs and the types of aid and support available to make completing the course feasible.

Experiential—lack of the high school preparation and work experience that make it likely a given postsecondary program would be completed.

Motivational—lack of interest in entering different career fields.

The fifth potential impediment is institutional—a lack of sufficient slots available in certain high return fields at two-year or four-year colleges. While career-oriented programs are more expensive than academic programs, it is our understanding that Florida has the resources to meet student demands for courses in different fields. Thus, a lack of student demand is the key factor limiting completion of certificate programs in most, if not all, high return fields in Florida. Indeed, support by employers is sufficiently strong to ensure more slots are made available in areas where employers are unable to find sufficient numbers of well qualified workers.

Of the four student-related impediments, we directly studied the academic "experiential" impediments—poor high school preparation and grades. It is this analysis that suggests: (a) high-performing low-income students substantially benefit from attaining BAs and graduate degrees by directly entering four-year colleges or by first obtaining AA degrees at two-year colleges and then transferring to four-year colleges; (b) low-performing low-income students substantially benefit by attaining certificates in heath-related, professional, and voc-tech fields; and (c) large numbers of low-income students do not take advantage of high-return postsecondary education opportunities.

In addition, our examination of the differences in postsecondary persistence and credential attainment between FRL and non-FRL students completing similar high school courses and receiving similar grades yields evidence that low-income students have additional impediments that reduce their chances of obtaining credentials.

We did not directly examine the effects of the remaining three impediments. In particular, we do not have any data indicating the extent to which low-income students' interests or non-academic skills are a major impediment to obtaining career-oriented certificates. However, the sheer diversity of career-oriented certificate programs suggests that almost every student would have the interest and skill to complete at least one of these programs.

On the other hand, it is clear that the majority of low-income students who did not perform especially well in high school and attended two-year colleges took courses that they were unlikely to complete or that would not have much effect on their earnings if they were completed. Since it would not have taken more time or money to substitute high-return courses with a greater likelihood of completion for those actually taken, it is logical to conclude that financial impediments were not an issue in most cases. At the same time, as far as we know two-year colleges lack the capacity to adequately assess and counsel students so that they have the information needed to select high-return courses that they would likely complete in career-oriented fields of interest.

Thus, there is strong circumstantial evidence that informational deficits are the primary impediment to obtaining certificates in high-return fields among low-performing low-income students entering two-year colleges. Importantly, there are highly effective and low cost ways to remove informational impediments. High-quality assessment and counseling services could be

provided at two-year colleges (and in high school) at low cost. For example, One-Stop Career Centers and military recruiters routinely offer such services at less than $100 per student.

With respect to the impediments that prevented more low-income 12th graders from even entering a two-year college, we cannot definitively rate the relative importance of informational versus financial impediments. Certainly, it is possible that many more low-income students would attend college if they had better information about the expected gains from obtaining certificates and degrees in different fields and the availability of financial aid programs. But it also is possible that many low-income students who did not attend college faced larger financial impediments than those who did, and more generous aid programs and/or better supportive programs (such as childcare) would be needed to substantially increase attainment of credentials for this group.

We also cannot definitively rate the role of financial and informational impediments in preventing more low-income students with AA degrees from transferring to four-year colleges and ultimately obtaining BA and graduate degrees. What is clear is that financial barriers are considerably greater in obtaining BAs than AAs. First, the direct cost of attending four-year colleges (e.g. tuition and fees) is greater than the direct cost of attending two-year colleges. Second, the indirect costs are much greater for students who cannot easily commute to four-year colleges and would have to relocate in order to obtain a BA. The costs include: no longer being able to live at home or with relatives, having to give up jobs in order to relocate; and having to find evening or weekend jobs because four-year colleges often require attendance during the day. Third, students may have depleted their savings and their ability to obtain funds from parents and relatives in obtaining AAs. Moreover, lack of information about the benefits of getting a BA and the ability to finance additional education through grants and loans could be major impediments.

The bottom line is that we have strong reason to suspect that low-cost informational services would be highly effective in increasing course completion, credential attainment and earnings, but we do not know enough about all the impediments and the cost-effectiveness of different ways to remove them to make definitive recommendations. Thus, it would be worthwhile to determine the cost-effectiveness of removing informational and other constraints, especially those that prevent low-income students from attending two-year colleges, completing high return courses, and obtaining certificates. The best evidence would come from demonstration projects that would assess informational and other deficits, deliver high-quality assessments and counseling, and then determine how this information affected course selection and credential attainment. These demonstrations could easily target students entering two-year college and those well on their way to obtaining AA degrees. They also are attractive because they could be set up at low cost and would quickly yield valuable information.

# Appendix 1
# Abbreviations and Definitions

### Abbreviations

AA – Associate degree
AP – Advanced Placement
BA – Bachelor's degree
FRL – Free and reduced price lunch
IB – International Baccalaureate
STEM – Science, Technology, Engineering, and Mathematics

### Definitions of the Types of Credentials

| Abbreviation Used in this Study | Full Credential Name and Description | Typical Time to Degree | Offered By | Degree Types |
|---|---|---|---|---|
| Certificate | *Technical Certificate*<br>Specific job training fast! | varies (ranges from a few months to 2 years) | career-technical centers<br>community colleges | Advanced Technology Certificate (ATC)<br>Applied Technology Diploma (ATD)<br>College Credit Certificate (CCC)<br>Vocational Certificate (VC) |
| AA | *Associate degree*<br>Specific job training or transfer to a university for a higher degree! | 2 years | community colleges | Associate in Arts (AA)<br>Associate in Science (AS)<br>Associate in Applied Science (AAS) |
| BA | *Undergraduate degree*<br>Study within a field that interests you. | 4 years | community colleges**<br>state universities | Bachelor's (BA, BAS, BS) |
| Grad | *Graduate degree*<br>Be an expert in a field of study. | varies (ranges from 1 to 5 years) | state universities | Master's (MA or MS)<br>Graduate Certificates<br>Doctoral (PhD, MD, EdD, JD, AuD) |

**Some community colleges offer Bachelor programs through partnerships with the state universities or an accredited private college or university. In addition to these partnerships, several community colleges offer their own Bachelor's degrees in selected program areas for which there is a high need for employees (i.e., teaching, nursing, and information technology).

Source: http://facts23.facts.org/navigation/detail/which_degree.do?pageId=030102

**Courses Included in Each Field of Concentration**

**Health Related**

Cardiovascular Technology
Chiropractic
Dental Assistant
Dental Hygiene
Dental Laboratory Technology
Dental Support
Dentistry
Electroneurodiagnostics
Emergency Medical Services
Gerontology
Health Information Management
Health Sciences/Resources
Interdisciplinary Health Sciences
Massage
Medical Assisting
Medical Imaging And Radiation Therapy
Medical Laboratory Science
Medicine
Midwifery
Nursing
Nutrition
Occupational Therapy
Ophthalmic Technology/Vision Care
Pharmacy
Physical Therapy
Physician Assistant
Practical Nursing/Health Care Providers
Prosthetics and Orthotics
Respiratory Care
Speech Pathology and Audiology
Surgical Technology Studies
Veterinary Medicine

**Humanities**

Art
Classical Languages and Literature
Dance
English Language and Literature
Foreign Language Education
Foreign Language: American Sign Language and Interpreting
Foreign Language: Amerindian Languages
Foreign Language: Arabic Language and Literature
Foreign Language: Catalan Language and Literature
Foreign Language: Central Asian Languages and Literature

Foreign Language: East Asian Languages and Literature
Foreign Language: French Language and Literature
Foreign Language: German and Germanic Languages and Literature
Foreign Language: Haitian Languages and Literature
Foreign Language: Hebrew Language and Literature
Foreign Language: Italian Language and Literature
Foreign Language: Portuguese Language and Literature
Foreign Language: Slavic Languages and Literature
Foreign Language: South Asian Languages and Literature
Foreign Language: Spanish Language and Literature
Foreign Language: Sub-Saharan African Languages and Literature
Foreign Languages (Modern and Classical)
Humanities
Language Arts and English Education
Linguistics
Medieval and Early Modern Studies
Music - Applied
Music - Other Than Applied
Philosophy
Religion
Theatre Arts

**Professional**

Accounting
Architecture
Banking
Business Education
Business Law
Criminal Justice
Drafting: Engineering Technologies
Finance
Fire Science
General Business
Hospitality Management
Law
Leadership Studies
Library and Information Studies
Management
Marketing
Mass Communication
Quantitative Methods In Business
Real Estate
Risk Management and Insurance
Surveying and Mapping

**Remedial**

Remedial Math
Remedial Reading
Remedial English

**Social Sciences**

African Studies
American and African-American Studies
Anthropology
Asian Studies
Economics
Education Systems
Education: Foundations and Policy Studies
Education: Administration and Supervision
Education: Counseling Services
Education: Exceptional Child
Education: Vocational - Industrial Arts
Educator Preparation Institutes
European Studies
Geography
History
History and Philosophy of Science
Interdisciplinary Social Sciences
International and Comparative Policy Studies
Jewish/Judaic Studies
Labor Studies
Latin American Studies
Political Science
Psychology
Public Administration
Social Studies Education
Social Work
Sociology
Women's Studies

**STEM**

Aeronautical Science
Biochemistry
Biological Science
Biomedical Engineering
Chemical/Nuclear Engineering
Chemistry
Civil/Environmental Engineering
Computer Math/Materials Engineering
Computer Science and Computing Technologies

Digital Media
Electrical Engineering
Electrical-Electronic Technology
Engineering Technologies
Engineering: General/Support
Environmental Studies
Geology
Industrial Engineering
Interdisciplinary Science/Natural Science
Mathematics
Mathematics Education
Mechanical Engineering
Meteorology
Oceanography/Ocean Engineering
Office Systems Technology
Physics
Science Education
Statistics

**Voc/Tech**

Agriculture
Building Construction
Cosmetology/Barbering
Graphic Arts
HVACR: Heat./Vent./Ac/Refrig.: Tech./Trades
Industrial Design
Integrated Pest Management
Mechanics: Auto/Bod/Diesel/Marine/Sm.Eng.
Military Science
Ornamental/Horticultural Science
Paralegal/Legal Assisting
Precision Metals Technology
Transportation and Logistics
Vocational Preparatory Instruction

**Other**

Adult Education
Communications
Cooperative Education
English As A Second Language/Teaching ESL
Family and Consumer Sciences
Funeral Services
Health/Leisure/Physical Education
Human Services
Interdisciplinary Studies and Honors

Interior Design
Landscape Architecture
Leisure
Mental Retardation
Oral Interpretation
Peace Studies
Photography
Physical Education
Reading
Speech Communication
Student Life Skills
Urban and Regional Planning

# Appendix 2
# Methodology for Regression Models

### Models of Highest Full-Time Earnings After College

The following linear model is estimated for the highest full-time post-college quarterly earnings for student *i*:

$$earn_i = \beta_0 + \beta_1 Cred_i + \beta_2 Course_i + \beta_3 Educ_i + \beta_4 Control_i + \varepsilon_i ,$$

Where $Cred_i$ denotes the highest credential received (certificate, AA, BA, or graduate degree); $Course_i$ represents course variables indicating the students' primary concentration and the number of courses taken in each concentration; $Educ_i$ represents educational preparation and performance including variables for high school GPA, whether the student completed Algebra II or higher in high school; whether the student completed a college preparatory curriculum in high school, the number of AP/IB and dual enrollment courses taken in math and science and other subjects, college GPA, and percent of remedial courses in college; $Control_i$ refers to control characteristics including student demographics, experience, location, and school characteristics; and $\varepsilon_i$ is the error term which is assumed to be normally distributed.

### Models of Postsecondary Persistence and Credential Completion

The following logistic regression model is estimated for individual *i* to predict the likelihood of each postsecondary outcome (outcome 1: complete 24+ credit hours (1=yes), outcome 2: receive any postsecondary credential (1=yes)):

$$\Pr(1) = \frac{\exp(\beta_{0+} \beta_1 HS_i + \beta_2 College_i + \beta_2 Student_i)}{1 + (\beta_{0+} \beta_1 HS_i + \beta_2 College_i + \beta_2 Student_i)},$$

where $HS_i$ represents high school preparation and performance including variables for high school GPA, whether the student completed Algebra II or higher in high school; whether the student completed a college preparatory curriculum in high school, the total number of AP/IB/dual enrollment courses; $College_i$ represents college preparation and performance including variables for college GPA, and percent of remedial courses in college; and $Student_i$ refers to student characteristics including race, gender, FRL status, locale, and dummy variables for primary college attended.

**Model of Choice of Concentration**

The following multinomial logistic regression model is estimated for individual *i* choosing concentration *j* over alternative concentration *k:*

$$P_{ij} = \frac{\exp(\beta_{0+} \beta_1 HS_{ij} + \beta_2 College_{ij} + \beta_2 Student_{ij})}{\sum_{k=1}^{m} \exp(\beta_{0+} \beta_1 HS_{ij} + \beta_2 College_{ij} + \beta_2 Student_{ij})},$$

where $HS_{ij}$ represents high school preparation and performance including variables for high school GPA, whether the student completed Algebra II or higher in high school; whether the student completed a college preparatory curriculum in high school, the total number of AP/IB/dual enrollment courses; $College_{ij}$ represents college preparation and performance including variables for college GPA, and percent of remedial courses in college; and $Student_{ij}$ refers to student characteristics including race, gender, FRL status, school locale, and dummy variables for primary college attended.

# Appendix 3
# Descriptive Statistics

**Mean, standard deviation, minimum values, and maximum values for variables in the earnings model (N=23,879)**

| | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| *Dependent Variable:* | | | | |
| Highest quarterly earnings | 9,693.38 | 5,675.59 | 3,042 | 62,500 |
| *Credential Variables:* | | | | |
| High credential: Certificate | 0.04 | 0.20 | 0 | 1 |
| High credential: AA | 0.41 | 0.49 | 0 | 1 |
| High credential: BA | 0.18 | 0.39 | 0 | 1 |
| High credential: Grad | 0.03 | 0.17 | 0 | 1 |
| *Courses Variables:* | | | | |
| Concentration=Humanities | 0.12 | 0.32 | 0 | 1 |
| Concentration=Health | 0.08 | 0.27 | 0 | 1 |
| Concentration=Professional | 0.24 | 0.43 | 0 | 1 |
| Concentration=STEM | 0.29 | 0.46 | 0 | 1 |
| Concentration=Social Science | 0.19 | 0.39 | 0 | 1 |
| Concentration=Vo/tech | 0.03 | 0.16 | 0 | 1 |
| # STEM courses | 11.35 | 8.66 | 0 | 66 |
| # Social Science courses | 7.77 | 6.66 | 0 | 50 |
| # Humanities courses | 7.50 | 6.22 | 0 | 86 |
| # Professional courses | 5.29 | 7.77 | 0 | 54 |
| # Health-related courses | 2.45 | 6.34 | 0 | 67 |
| # Voc/Tech courses | 0.69 | 2.83 | 0 | 40 |
| # Other courses | 3.38 | 3.79 | 0 | 40 |
| *Educational Preparation and Performance Variables:* | | | | |
| HS GPA (continuous) | 3.97 | 0.57 | 0 | 5 |
| Algebra II or higher | 0.88 | 0.33 | 0 | 1 |
| College preparatory curriculum | 0.67 | 0.47 | 0 | 1 |
| # AP/IB math and science | 0.30 | 0.80 | 0 | 7 |
| # AP/IB other | 0.73 | 1.69 | 0 | 12 |
| # Dual enroll math and science | 0.11 | 0.36 | 0 | 5.52 |
| # Dual enroll other | 0.39 | 0.95 | 0 | 11 |
| College GPA (continuous) | 3.65 | 0.75 | 0 | 5 |
| % of college courses that are remedial | 0.07 | 0.16 | 0 | 1 |
| *Control Variables:* | | | | |
| Female: Yes | 0.57 | 0.49 | 0 | 1 |
| Female: Missing | 0.07 | 0.26 | 0 | 1 |
| Age | 25.30 | 0.60 | 22 | 31 |
| Black | 0.17 | 0.37 | 0 | 1 |
| Hispanic | 0.12 | 0.33 | 0 | 1 |

| | Mean | Std. Dev. | Min | Max | |
|---|---|---|---|---|---|
| FRL: Yes | 0.19 | 0.39 | 0 | 1 | |
| FRL: missing | 0.07 | 0.26 | 0 | 1 | |
| Limited English proficiency | 0.10 | 0.30 | 0 | 1 | |
| Mental disability | 0.03 | 0.17 | 0 | 1 | |
| # quarters from leaving HS to enter college | 2.46 | 2.07 | 0 | 12 | |
| # quarters w/earnings while in HS | 14.18 | 1.03 | 3 | 30 | |
| Avg. earnings in HS quarters w/earnings | 851.39 | 716.10 | 0 | | 20,000 |
| # quarters w/earnings while in college | 14.59 | 6.99 | 0 | 42 | |
| Highest quarterly earnings in college | 6,207.05 | 5,271.07 | 0 | | 538,144 |
| # quarters from leaving college to post-college earnings | 0.40 | 1.47 | 0 | 19 | |
| # quarters of post-college earnings | 7.16 | 4.41 | 1 | 27 | |
| School locale: large city | 0.10 | 0.30 | 0 | 1 | |
| School locale: mid-size city | 0.20 | 0.40 | 0 | 1 | |
| School locale: urban fringe of large city | 0.27 | 0.44 | 0 | 1 | |
| School locale: small town | 0.05 | 0.22 | 0 | 1 | |
| School locale: rural, outside CBSA/MSA | 0.02 | 0.15 | 0 | 1 | |
| School locale: rural, inside CBSA/MSA | 0.09 | 0.29 | 0 | 1 | |
| School locale: missing data | 0.01 | 0.12 | 0 | 1 | |
| District MSA: Daytona Beach FL | 0.04 | 0.19 | 0 | 1 | |
| District MSA: Fort Lauderdale FL PMSA | 0.11 | 0.31 | 0 | 1 | |
| District MSA: Fort Myers-Cape Coral FL | 0.03 | 0.16 | 0 | 1 | |
| District MSA: Fort Pierce-Port St. Lucie FL | 0.02 | 0.14 | 0 | 1 | |
| District MSA: Fort Walton Beach FL | 0.02 | 0.14 | 0 | 1 | |
| District MSA: Gainesville FL | 0.04 | 0.19 | 0 | 1 | |
| District MSA: Jacksonville FL | 0.06 | 0.24 | 0 | 1 | |
| District MSA: Lakeland-Winter Haven FL | 0.03 | 0.17 | 0 | 1 | |
| District MSA: Melbourne-Titusville-Palm Bay FL | 0.05 | 0.21 | 0 | 1 | |
| District MSA: Miami FL PMSA | 0.14 | 0.35 | 0 | 1 | |
| District MSA: Naples FL | 0.02 | 0.14 | 0 | 1 | |
| District MSA: Ocala FL | 0.02 | 0.13 | 0 | 1 | |
| District MSA: Orlando FL | 0.01 | 0.12 | 0 | 1 | |
| District MSA: Panama City FL | 0.01 | 0.12 | 0 | 1 | |
| District MSA: Pensacola FL | 0.05 | 0.21 | 0 | 1 | |
| District MSA: Punta Gorda FL | 0.01 | 0.12 | 0 | 1 | |
| District MSA: Sarasota-Bradenton FL | 0.03 | 0.18 | 0 | 1 | |
| District MSA: Tallahassee FL | 0.02 | 0.14 | 0 | 1 | |
| District MSA: Tampa-St. Petersburg-Clearwater FL | 0.15 | 0.36 | 0 | 1 | |
| District MSA: West Palm Beach-Boca Raton FL | 0.07 | 0.25 | 0 | 1 | |
| School % FRL | 0.27 | 0.15 | 0 | 1 | |
| School % Black | 0.20 | 0.17 | 0 | 1 | |
| School % Hispanic | 0.13 | 0.19 | 0 | 1 | |
| School % students reaching grade 12 | 0.66 | 0.09 | 0.02 | 1 | |

# Appendix 4
# Results for Regression Models

**OLS regression results for highest full-time post-college quarterly earnings**

| | β | Std. Err. | β | Std. Err. | β | Std. Err. |
|---|---|---|---|---|---|---|
| *Credential Variables:* | | | | | | |
| High credential: Certificate | 5295.26 | 175.83 | 4049.28 | 202.07 | 3114.00 | 221.39 |
| High credential: AA | 3199.07 | 82.47 | 2655.63 | 109.12 | 1935.05 | 126.16 |
| High credential: BA | 896.28 | 98.02 | 455.93 | 101.34 | -19.04 | 108.97 |
| High credential: Grad | 1568.20 | 199.67 | 962.46 | 203.43 | 1304.84 | 222.03 |
| *Courses Variables:* | | | | | | |
| Concentration=Humanities | | | 165.97 | 234.14 | 38.09 | 233.95 |
| Concentration=Health | | | 521.97 | 292.18 | 342.24 | 291.84 |
| Concentration=Professional | | | 809.76 | 239.54 | 642.19 | 239.31 |
| Concentration=STEM | | | 682.48 | 215.59 | 574.20 | 215.73 |
| Concentration=Social Science | | | 909.72 | 235.74 | 734.38 | 235.64 |
| Concentration=Vo/tech | | | -356.12 | 416.76 | -221.08 | 416.40 |
| # STEM courses | | | 24.60 | 4.89 | 22.47 | 5.02 |
| # Social Science courses | | | 4.93 | 8.42 | 6.81 | 8.54 |
| # Humanities courses | | | -7.24 | 6.80 | -6.27 | 6.82 |
| # Professional courses | | | 30.68 | 8.65 | 33.74 | 8.67 |
| # Health-related courses | | | 130.00 | 9.59 | 128.04 | 9.57 |
| # Vo/Tech courses | | | 92.06 | 21.07 | 87.52 | 21.02 |
| # Other courses | | | 20.92 | 12.31 | 24.74 | 12.32 |
| *Educational Preparation and Performance Variables:* | | | | | | |
| HS GPA (continuous) | | | | | 174.26 | 80.83 |
| Algebra II or higher | | | | | 97.07 | 114.19 |
| # AP/IB math and science | | | | | 188.96 | 60.31 |
| # AP/IB other | | | | | -109.06 | 28.78 |
| # Dual enroll math and science | | | | | 89.70 | 105.99 |
| # Dual enroll other | | | | | -18.96 | 42.21 |
| College GPA (continuous) | | | | | 531.06 | 62.13 |
| % of college courses that are remedial | | | | | -1597.73 | 286.03 |
| Number of observations | | 23,879 | | 23,879 | | 23,879 |
| $R^2$ | | 0.20 | | 0.22 | | 0.23 |

The following control variables are included in all models (coefficients not reported here): student demographics: gender, age, race, FRL status, Limited English Proficiency status, mental disability; experience: # quarters from leaving HS to entering college, # quarters with earnings in HS, average quarterly earnings in HS, # quarters with earnings in college, highest quarterly earnings in college, # quarters from leaving college to post-college earnings, # quarters of post-college earnings; location: school locale, district MSA; and school characteristics: % FRL, % Black, % Hispanic, % students reaching grade 12

**Logistic regression results for the likelihood of completing 24 or more credit hours for students entering postsecondary education within two years of high school[19]**

| | β | Std. Err. |
|---|---|---|
| High school GPA | -0.06 | 0.03 |
| Algebra II or higher | 0.04 | 0.03 |
| College prep curriculum | 0.20 | 0.03 |
| Total # AP/IB/Dual enrollment courses | -0.10 | 0.01 |
| College GPA | 1.03 | 0.01 |
| % remedial courses in college | -2.70 | 0.06 |
| | | |
| Number of observations | | 48,258 |
| Pseudo $R^2$ | | 0.35 |

The following control variables are included in the model (coefficients not reported here): race, gender, FRL, locale, and dummy variables for primary college attended.

**Predicted values for the likelihood of completing 24 or more credit hours, by hypothetical student groups**

| | "A" Student | "B" Student | "C" Student |
|---|---|---|---|
| Likelihood of completing 24+ credit hours | 89% | 68% | 49% |

[19] The model includes fixed effects for the institution attended. The institution dummy variables pick up some of the effect of high school preparation and performance, since the highest performing students tend to enroll at the most selective institutions. When institution fixed effects are not included in the model, the variables for high school GPA, Algebra II, and college preparatory curriculum are positive and statistically significant, while the coefficient on the variable for AP/IB/Dual enrollment courses is non-significant.

**Logistic regression results for the likelihood of selecting each concentration for students with 24 or more credit hours**

| | β | Std. Err. |
|---|---|---|
| **Health-Related** | | |
| High school GPA | 0.21 | 0.06 |
| Algebra II or higher | 0.01 | 0.09 |
| College prep curriculum | 0.15 | 0.06 |
| Total # AP/IB/Dual enrollment courses | 0.03 | 0.01 |
| College GPA | 0.99 | 0.05 |
| % remedial courses in college | 2.65 | 0.22 |
| **Humanities** | | |
| High school GPA | -0.05 | 0.05 |
| Algebra II or higher | -0.27 | 0.07 |
| College prep curriculum | -0.06 | 0.05 |
| Total # AP/IB/Dual enrollment courses | 0.12 | 0.01 |
| College GPA | 0.02 | 0.04 |
| % remedial courses in college | -1.78 | 0.26 |
| **Professional** | | |
| High school GPA | 0.09 | 0.05 |
| Algebra II or higher | 0.32 | 0.07 |
| College prep curriculum | 0.03 | 0.05 |
| Total # AP/IB/Dual enrollment courses | 0.04 | 0.01 |
| College GPA | 0.53 | 0.03 |
| % remedial courses in college | 2.68 | 0.20 |
| **Remedial** | | |
| High school GPA | -0.14 | 0.08 |
| Algebra II or higher | -0.28 | 0.09 |
| College prep curriculum | 0.10 | 0.08 |
| Total # AP/IB/Dual enrollment courses | -0.64 | 0.08 |
| College GPA | -0.57 | 0.05 |
| % remedial courses in college | 6.78 | 0.22 |
| **Social Science** | | |
| High school GPA | -0.10 | 0.05 |
| Algebra II or higher | -0.14 | 0.07 |
| College prep curriculum | 0.11 | 0.05 |
| Total # AP/IB/Dual enrollment courses | 0.06 | 0.01 |
| College GPA | 0.43 | 0.04 |
| % remedial courses in college | -3.26 | 0.29 |

| | β | Std. Err. |
|---|---|---|
| **STEM** | | |
| High school GPA | 0.25 | 0.05 |
| Algebra II or higher | 0.12 | 0.07 |
| College prep curriculum | 0.07 | 0.05 |
| Total # AP/IB/Dual enrollment courses | 0.12 | 0.01 |
| College GPA | 0.02 | 0.03 |
| % remedial courses in college | -1.56 | 0.22 |
| **Voc/Tech** | | |
| High school GPA | 0.06 | 0.09 |
| Algebra II or higher | 0.12 | 0.11 |
| College prep curriculum | -0.14 | 0.09 |
| Total # AP/IB/Dual enrollment courses | 0.00 | 0.02 |
| College GPA | 0.34 | 0.06 |
| % remedial courses in college | 5.59 | 0.23 |
| Number of observations | | 36,610 |
| Pseudo $R^2$ | | 0.10 |

The following control variables are included in the model (coefficients not reported here): race, gender, FRL, locale, and dummy variables for primary college attended.

**Predicted values for the likelihood of selecting each concentration, by hypothetical student groups**

| | "A" Student | "B" Student | "C" Student |
|---|---|---|---|
| Health-Related | 10% | 7% | 5% |
| Humanities | 11% | 14% | 15% |
| Professional | 25% | 18% | 14% |
| Remedial | 1% | 8% | 18% |
| Social Science | 20% | 16% | 14% |
| STEM | 23% | 24% | 19% |
| Vo/Tech | 2% | 3% | 4% |
| Other | 8% | 10% | 11% |

**Logistic regression results for the likelihood of attaining any postsecondary credential**

| | All students | | All 24+ Credit hrs | |
|---|---|---|---|---|
| | β | Std. Err. | β | Std. Err. |
| High school GPA | 0.00 | 0.03 | -0.02 | 0.03 |
| Algebra II or higher | 0.23 | 0.04 | 0.24 | 0.04 |
| College prep curriculum | 0.19 | 0.03 | 0.15 | 0.03 |
| Total # AP/IB/Dual enrollment courses | -0.05 | 0.01 | -0.02 | 0.01 |
| College GPA | 1.47 | 0.02 | 1.74 | 0.02 |
| % remedial courses in college | -1.95 | 0.08 | -0.80 | 0.09 |
| | | | | |
| Number of observations | | 48,274 | | 36,592 |
| Pseudo $R^2$ | | 0.36 | | 0.29 |

| | Health-Related | | Humanities | |
|---|---|---|---|---|
| | β | Std. Err. | β | Std. Err. |
| High school GPA | -0.13 | 0.13 | 0.00 | 0.09 |
| Algebra II or higher | 0.36 | 0.17 | 0.02 | 0.12 |
| College prep curriculum | 0.23 | 0.13 | 0.13 | 0.09 |
| Total # AP/IB/Dual enrollment courses | -0.03 | 0.03 | 0.02 | 0.02 |
| College GPA | 1.55 | 0.11 | 1.64 | 0.06 |
| % remedial courses in college | -1.15 | 0.35 | -6.41 | 0.71 |
| | | | | |
| Number of observations | | 2,938 | | 4,602 |
| Pseudo $R^2$ | | 0.20 | | 0.31 |

| | Professional | | Remedial | |
|---|---|---|---|---|
| | β | Std. Err. | β | Std. Err. |
| High school GPA | 0.04 | 0.09 | 0.02 | 0.34 |
| Algebra II or higher | 0.46 | 0.13 | -0.03 | 0.31 |
| College prep curriculum | 0.10 | 0.09 | 0.21 | 0.31 |
| Total # AP/IB/Dual enrollment courses | -0.03 | 0.02 | -0.21 | 0.43 |
| College GPA | 1.92 | 0.08 | 0.88 | 0.20 |
| % remedial courses in college | 1.25 | 0.29 | 1.94 | 0.72 |
| | | | | |
| Number of observations | | 7,771 | | 1,443 |
| Pseudo $R^2$ | | 0.24 | | 0.15 |

| | Social Science | | STEM | |
|---|---|---|---|---|
| | β | Std. Err. | β | Std. Err. |
| High school GPA | -0.43 | 0.09 | 0.01 | 0.06 |
| Algebra II or higher | 0.27 | 0.12 | -0.08 | 0.09 |
| College prep curriculum | 0.15 | 0.08 | 0.19 | 0.06 |
| Total # AP/IB/Dual enrollment courses | -0.06 | 0.02 | 0.01 | 0.01 |
| College GPA | 2.36 | 0.07 | 1.47 | 0.05 |
| % remedial courses in college | -5.67 | 0.70 | -3.42 | 0.37 |
| | | | | |
| Number of observations | | 6,582 | | 8,500 |
| Pseudo $R^2$ | | 0.35 | | 0.23 |

| | Vo/Tech | | Other | |
|---|---|---|---|---|
| | β | Std. Err. | β | Std. Err. |
| High school GPA | 0.45 | 0.17 | -0.09 | 0.10 |
| Algebra II or higher | 0.06 | 0.23 | -0.02 | 0.14 |
| College prep curriculum | 0.67 | 0.20 | 0.18 | 0.10 |
| Total # AP/IB/Dual enrollment courses | 0.02 | 0.05 | -0.07 | 0.03 |
| College GPA | 0.79 | 0.12 | 1.73 | 0.08 |
| % remedial courses in college | 0.33 | 0.30 | -1.86 | 0.46 |
| | | | | |
| Number of observations | | 984 | | 3,393 |
| Pseudo $R^2$ | | 0.23 | | 0.33 |

The following control variables are included in the models (coefficients not reported here): race, gender, FRL, locale, and dummy variables for primary college attended.

**Predicted values for the likelihood of attaining a postsecondary credential, by hypothetical student groups**

| Likelihood of receiving any credential | "A" Student | "B" Student | "C" Student |
|---|---|---|---|
| Health-Related | 89% | 77% | 70% |
| Humanities | 65% | 34% | 25% |
| Professional | 91% | 78% | 75% |
| Remedial | 7% | 4% | 3% |
| Social Science | 83% | 62% | 54% |
| STEM | 67% | 42% | 34% |
| Voc/Tech | 86% | 66% | 53% |
| Other | 66% | 36% | 26% |
| Students with 24+ credit hours | 78% | 50% | 38% |
| All students | 69% | 35% | 19% |

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