Project Report Cover Page

Using State Student Record Data to Map Pathways to Success for Underserved Community College Students

Final Project Report

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Final Paper

Making Every Mile Count: Pathways to Success for Older Students in Community Colleges

Pathways to Success

What are the pathways to success in postsecondary education? One well-trodden, if exclusive, path is to come from a family with high SES (socioeconomic status), be young, and attend a selective four-year institution. Research suggests that these characteristics significantly increase the likelihood of educational success as measured by degree completion (Adelman, 1999, 2004; Alfonso, Bailey, & Scott, 2005). But for those who don't have the benefit of these pathway characteristics, what others might lead to some measure of success? Community colleges, which, by definition, enroll students who are already missing one of those three favorable factors for success, and with vast numbers of students who have neither of the other two characteristics, face the task of identifying these pathways and helping students follow them to reach their own educational success.

In order to map pathways to success we must first identify measures of success applicable to students at community colleges. Unlike at four-year institutions, where the principal yardstick for success is a bachelor's degree, community colleges, with multiple missions and a student population with diverse goals and expectations, have no such universal measure. Part of the problem may lie with the way that we measure success. Rather than assigning a measure based on institutional degree-granting capacity or program outcomes, a more appropriate measure of success might depend on a student's educational background, enrollment intentions, and educational objectives. These can be very different for different types of students. In fact, Cliff Adelman contends that "one demographic variable makes an enormous difference in the distribution of virtually any postsecondary outcome or process – age at the time of first entry to a postsecondary institution" (2005, p. 119). He continues that "both analyses of student populations and institutional reporting should either divide the population by age brackets or, in multivariate models, use age as an independent variable" (2005, p.119).

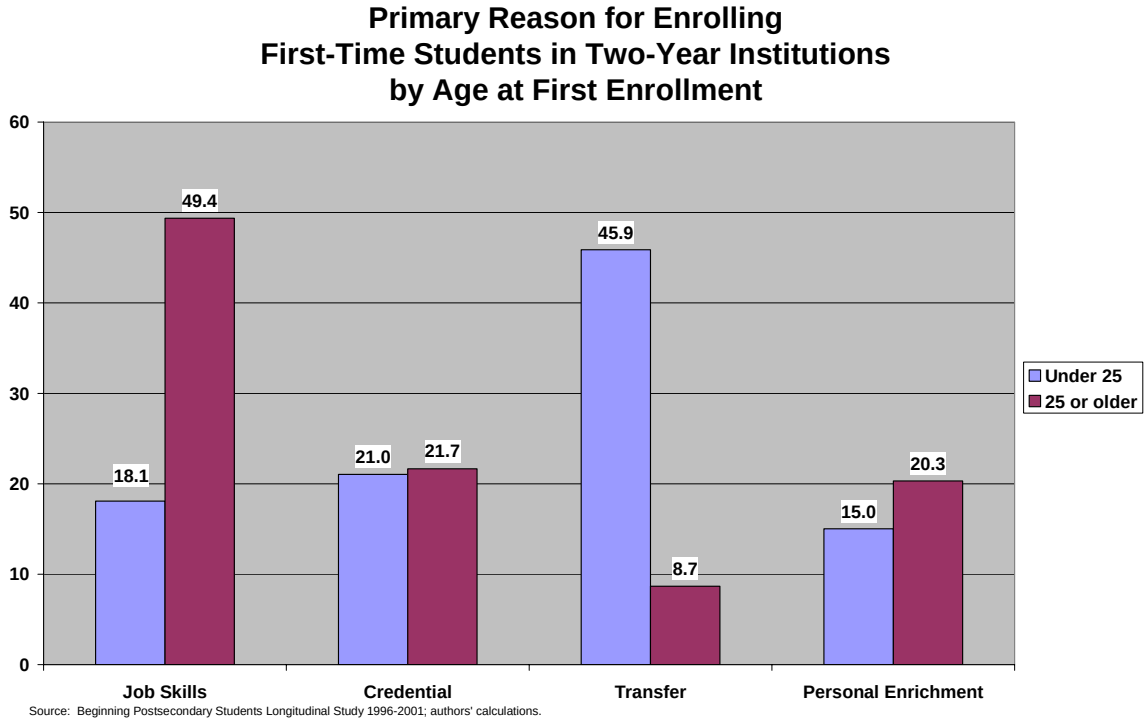
We concur strongly with this assessment of the importance of student age at entry. It operates as the instrumental variable for the analyses in this report on student success at community colleges. Older students are more likely to be working while enrolled, married, caring for children, and less engaged than other more traditional-aged students in the college (S. P. Choy & Premo, 1995; Horn & Carroll, 1996). They are also more likely to attend part-time, to enroll in occupational programs rather than academic ones, and to seek occupational certificates rather than associate degrees or transfer to a four-year institution (T. R. Bailey et al., 2003). Hence, age of college entry serves as a proxy for other characteristics that are more common to older individuals than younger ones. Age can also explain differences in educational objectives and expectations. A recent study by the National Center for Education Statistics (NCES) that used the National Postsecondary Student Aid Study (NPSAS) from 2003-04 found that older students in community colleges are less committed to a degree program than their

younger counterparts (Horn & Nevill, 2006). We explore this and other differences by age in the next section.

Age and Educational Goals

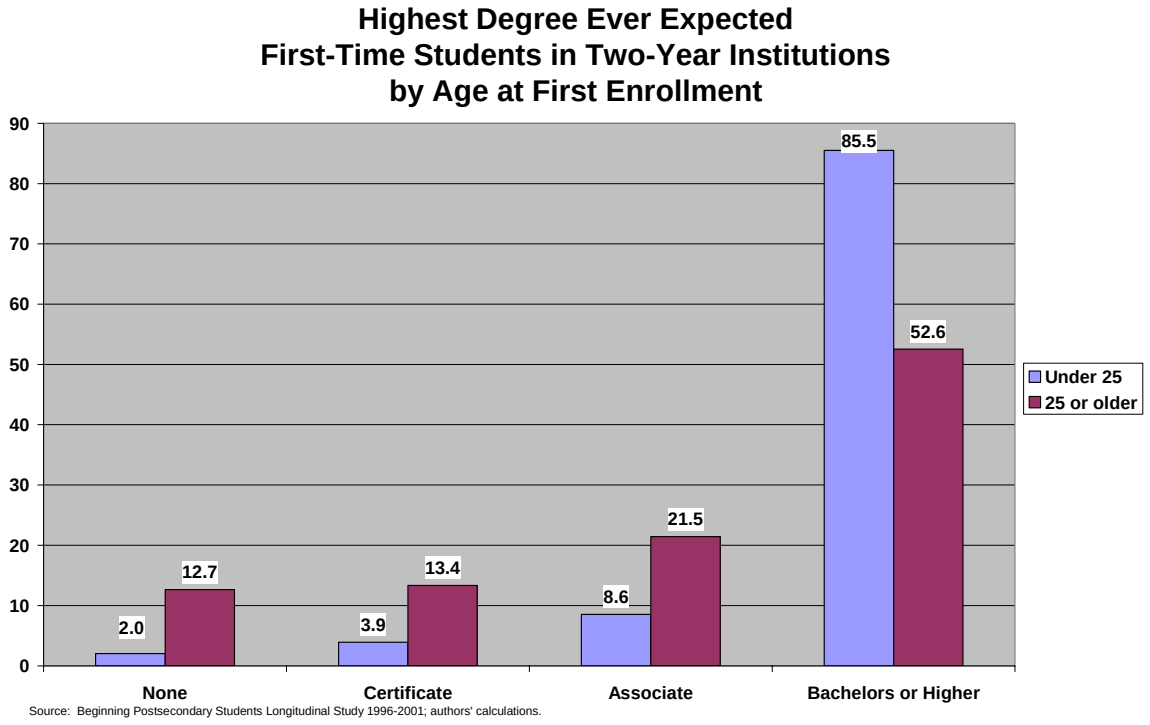
Students who are 25 and older who begin their postsecondary education at a community college have strikingly different intentions and expectations for their higher education than their younger counterparts. The Beginning Postsecondary Student Longitudinal Study of 1996-2001 (BPS), a national survey of first-time students in higher education in 1995-96, specifically asked students in two-year institutions their primary reason for enrolling (U.S. Department of Education, 2003a). Response options included: credential (degree or certificate), transfer (to one of a variety of types of institutions), job skills, or personal enrichment. Figure 1 presents the different responses by age of student.

Figure 1



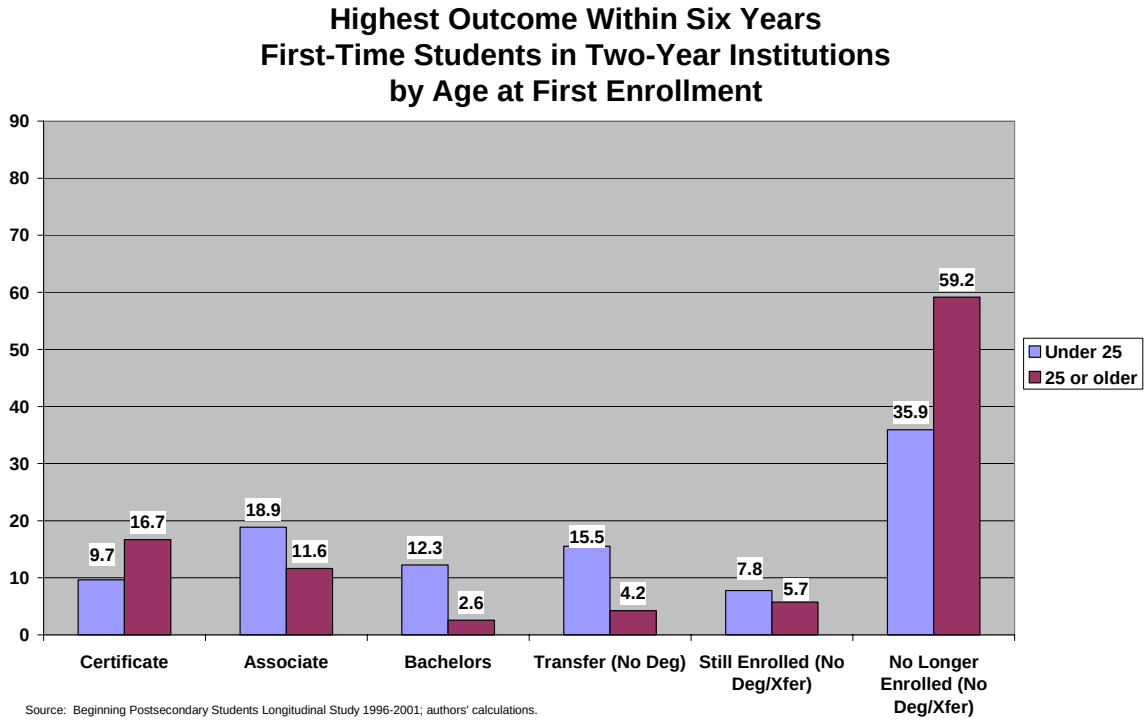
While reason for enrolling might provide an initial clue for why someone steps onto the postsecondary pathway, we need to know where they expect to head along that pathway. The BPS survey also asked students the highest degree that they ever expect to earn. Figure 2 shows that while most students think that they will earn at least a bachelor's degree at some point, it reveals differences whereby older students' expectations are much more modest and, perhaps, realistic.

Figure 2



Do differences in intentions and expectations lead to different outcomes? We have explored this question elsewhere and have found some limited evidence showing this relationship ((T. R. Bailey, Jenkins, & Leinbach, 2005). In Figure 3 we present the degree outcomes as evidence of the relative weakness of older students by the most common measure of success – earning a credential. It gives the six-year highest outcomes for the BPS sample of first-time community college students. Compared with students who started college soon after high school (at ages 18-24), those who started college at age 25 or later were more likely to earn a certificate, less likely to earn an associate degree, and much less likely to either have transferred to a four-year institution or earned a bachelor's degree as their highest outcome. Furthermore, nearly sixty percent of older first-time students did not earn any credential or transfer and stopped their education after six years. This compares to 36 percent of younger first-time students.

Figure 3



Given that many older students have to balance work, family and schooling, it is not surprising that these community college students are less likely to complete postsecondary programs than are younger ones. In addition, nearly half of them enroll with the primary reason to advance their job skills and another fifth do so for personal enrichment (see Figure 1). While these main objectives do not preclude the additional goal of earning a credential, it indicates less primacy, or perhaps lower expectations, in their educational pathway.

For most students, but particularly older ones who may have established jobs and family obligations, the decision to attend higher education is not made lightly given that it entails, for many, significant investment in time and money foregone in other spheres of their lives. Given the costs incurred, it may seem surprising that older students in community colleges exhibit relatively low rates of degree completion, transfer, or persistence.

Age and Benefits of Postsecondary Education

Human capital theory (Becker, 1964) explains college investment decisions, degree completion, and drop out rates by asserting that individuals examine the financial and temporal costs of education before starting, continuing, and completing any postsecondary education. The simplest model predicts an optimal decision to be taken at a single point in time, typically after high school, in order to maximize lifetime earnings. In this model, age of entrance to higher education becomes a key negative factor associated with lifetime earnings. Yet, adults may have important reasons to reconsider their original decision and enroll in postsecondary education. The wage differential between high school and college graduates has been growing since 1980

(Katz & Autor, 1999), partially due to the changes in the relative supply of highly educated workers (Card & Lemieux, 2001). In response to the increased market demand for skills, adults may return to school and enroll in short-term programs to close the wage gap. In fact, in fall 2002, adults between ages 25 and 64 represented 35 percent of full-time-equivalent (FTE) enrollments at two-year public colleges (U.S. Department of Education, 2003b, authors' calculations). Studies focusing on older workers have found positive and significant returns to an academic year of schooling, and these results are neither significantly higher nor lower than returns for younger students (L. Jacobson, LaLonde, & Sullivan, 2004; Leigh & Gill, 1997).

The factors associated with older students can certainly affect enrollment patterns, enrollment intensity, and the probability of completing a degree (S. Choy, 2002). Successful completion of degrees and certificates is critical because at least some postsecondary training is needed, on average, to advance beyond the wages earned by those with only high school diplomas (Grubb, 2002a; T. J. Kane & Rouse, 1999). In addition, studies focusing on retraining older workers at community colleges have found positive and significant returns to an academic year of schooling at a community college: From 7 to 13 percent for both men and women (compared to those who had lost their jobs and did not pursue training), with a higher return for more vocational than academic coursework (L. Jacobson et al., 2004; Louis Jacobson, LaLonde, & Sullivan, 2005).

Older Students at Community Colleges

Community colleges are an important entry point to postsecondary education for adults with no previous college education (Cohen & Brawer, 1996). In fact, community colleges are their primary entry point. According to the most recent survey from the National Center for Education Statistics (NCES) from the 2003-04 school year, 58 percent of students 25 and older were enrolled at two-year institutions (which, in total, enrolled 47 percent of all undergraduates).[1] In contrast, four-year institutions, which enrolled 50 percent of all undergraduates, had only 37 percent of students 25 and older.[2] Overall, 48 percent of all students enrolled in two-year institutions during that year were 25 or older, compared to only 29 percent of undergraduates at four-year institutions. Among first-time students, 26 percent enrolled in two-year institutions were 24 years or older, while only 6 percent of first-time students in four-year institutions were 24 or older (U.S. Department of Education, 1998).

Despite the prevalence of older students in community colleges, there has been relatively little research on the course-taking patterns of older community college students, how the educational experience of these students differs from that of younger students, and what such differences mean for their relative economic outcomes. One reason is that much of the research on the educational and economic outcomes of undergraduate students generally is based on national surveys such as High School & Beyond 1980-1992 (HS&B) and the National Education Longitudinal Study of 1988 (NELS), which track secondary school students who enter postsecondary education within eight years, and therefore do not capture the experience of older students. While BPS contains data from a nationally representative sample of all beginning

[1] U.S. Department of Education, National Center for Education Statistics, 2003-04 National Postsecondary Student Aid Study (NPSAS:04), Data Analysis System.
[2] Remaining students were enrolled in less than two-year institutions.

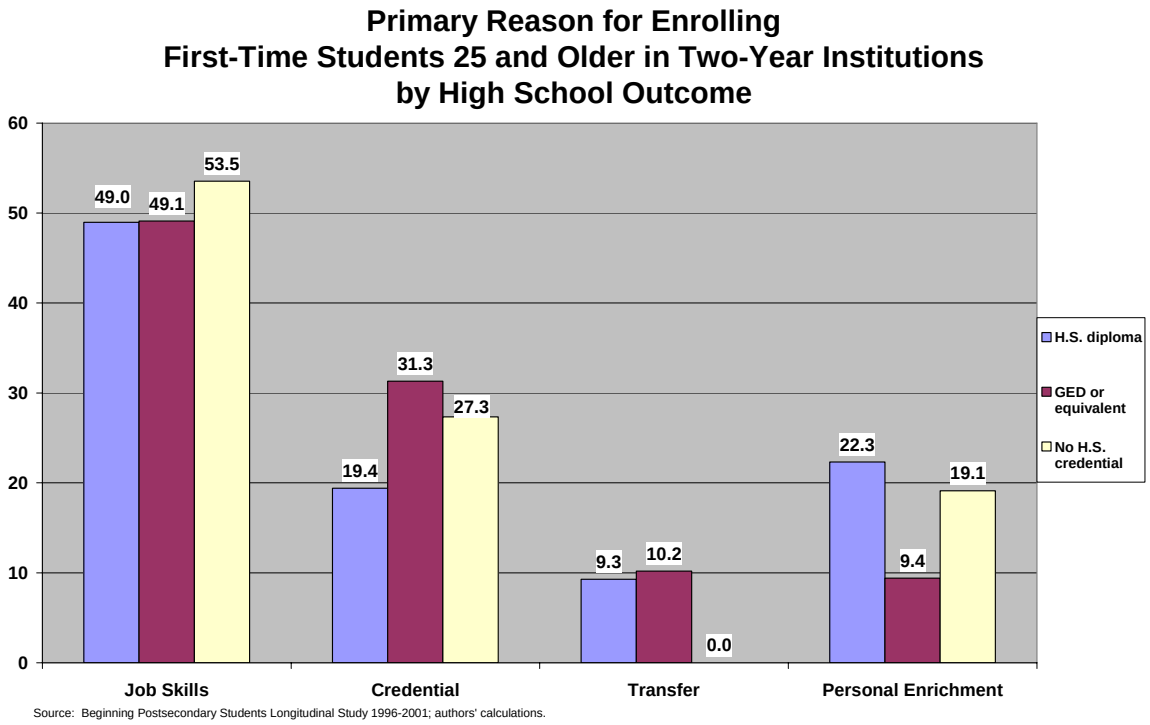
postsecondary students, including older first-time college students, it does not contain student transcript information (HS&B and NELS have student transcripts). This limits the utility of BPS as a source of information on students' courses, sequencing, and other enrollment patterns. However, numerous states do collect unit record data that allow the tracking of students within their higher education systems and can provide us with larger sample sizes and detailed information about individuals. We take advantage of two such state datasets for the research presented in this report.

We know even less about what happens to adults in adult basic skills programs, which, in many states, are provided by community colleges. A number of recent reports have described exemplary efforts to help adults make the transition from basic skills to college-level programs in occupational fields (Chisman, 2004; Jenkins, 2003; Jobs for the Future, 2004; Morest, 2003; Walker & Strawn, 2004), but these rely on case studies and provide little evidence of program outcomes. The few rigorous studies that have examined outcomes of adult basic skills students indicate that earning a general equivalency diploma (GED) may increase the chances that an individual will go on for further education or training, but generally provides little benefit in terms of employment and earnings (Beder, 1999; Bos, 1996; Bos, Scrivener, Snipes, & Hamilton, 2002; D'Amico, 1997, 1999; Strawn, 1998). Much of what is known about the educational and labor market impacts of adult basic education is based on research on the welfare population. Yet, findings with respect to welfare participants may not be applicable to other adults with limited basic skills, for example, immigrants who are not on welfare. Furthermore, there have been no rigorous experimental or longitudinal studies on the impact of English as a Second Language (ESL) programs (Van Duzer, Peyton, & Comings, 1998).

Although BPS does not have the data to support the analyses of older students' pathways and outcomes in their postsecondary education (including basic skills, GED, and ESL), it helps demonstrate the need for such detailed analyses. The figures below, derived from BPS, show just the older first-time student population at two-year institutions for the same variables in the three earlier charts. Here, the sample is divided by high school background: Whether the student has a high school diploma, a GED, or no high school credential.[3] While the differences within the older population are less distinct than those between older and younger students, we clearly see that those without a high school credential are less likely to enroll for credentials or transfer and have lower expectations for such outcomes. Nearly nine out of ten such students depart higher education within six years without a measurable outcome. Students with GEDs and diplomas are much more similar to each other, though the former do have slightly higher degree expectations, and tend to exhibit that in their outcomes.

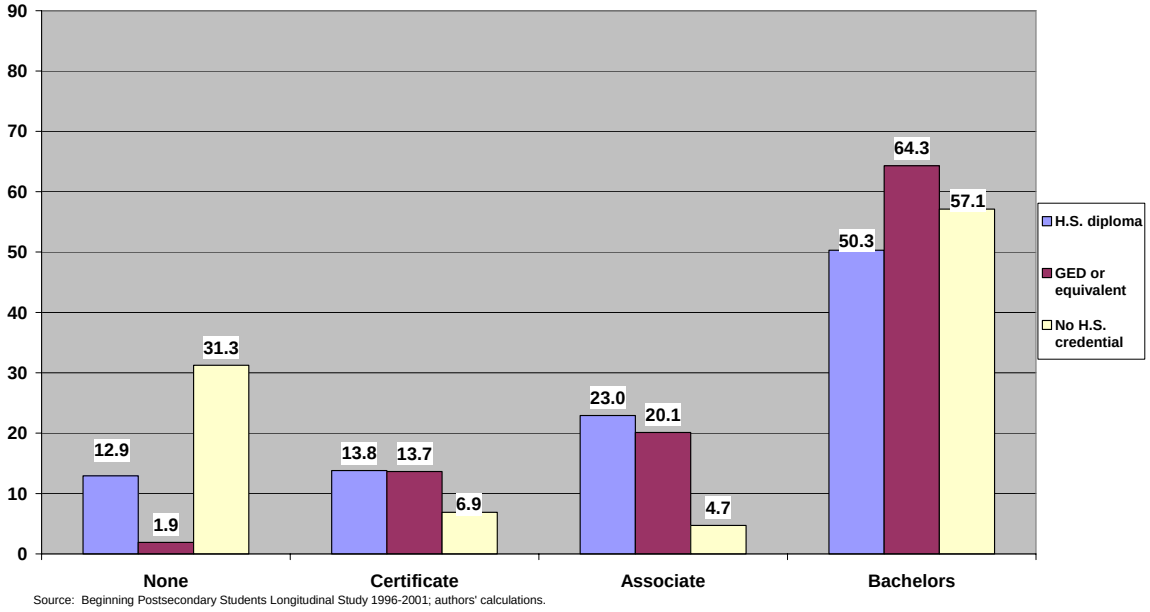
[3] Sample size is 306 (235 with a high school diploma, 53 with a GED, and 18 with no high school credential).

Figure 4



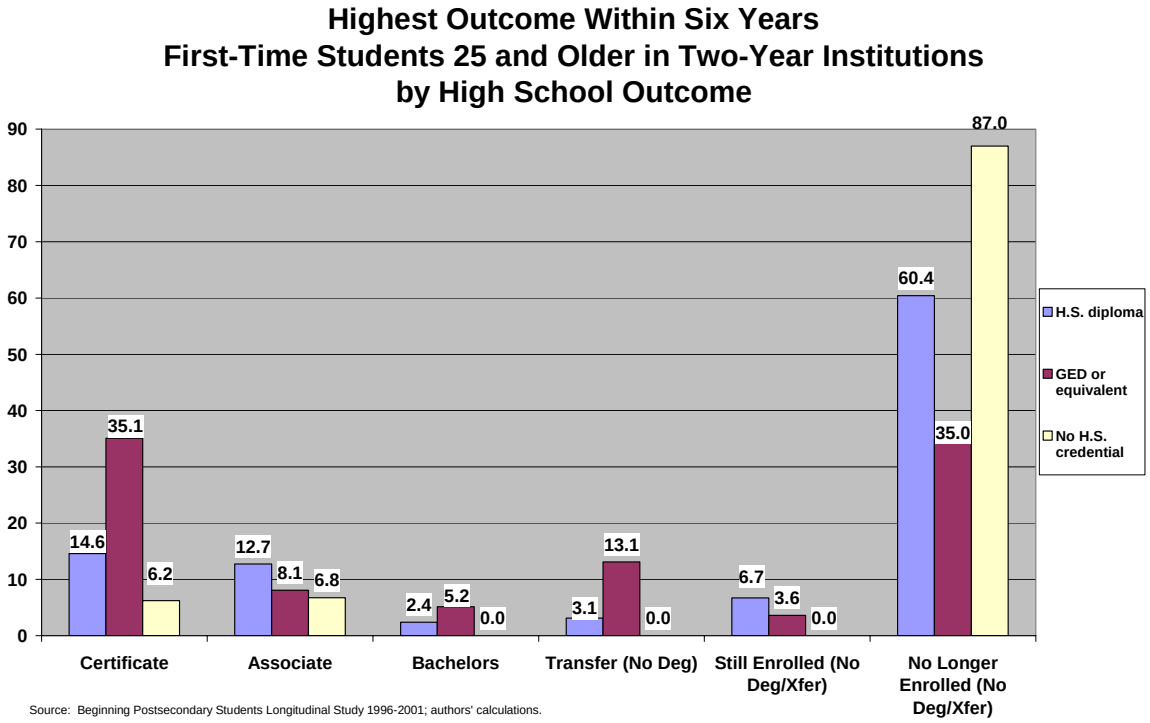
Source: Beginning Postsecondary Students Longitudinal Study 1996-2001; authors' calculations.

Figure 5



Source: Beginning Postsecondary Students Longitudinal Study 1996-2001; authors' calculations.

Figure 6



Structure of the Report

The results of the studies reported here will contribute to our understanding of student success at community colleges and will inform community college policy and practice for helping students achieve success in both their educational and labor market outcomes. We investigated outcomes for older students entering postsecondary education for the first time, including those without a high school diploma or who are enrolled in adult basic education (ABE) or ESL classes. Such students are often from low SES households, attend part-time or intermittently, and may be from minority populations, all characteristics which studies have shown, lead to lower rates of persistence or completion of degrees than for other students. These types of students also represent a disproportionate share of community college populations, when compared to students at four-year institutions.

This report is part of a larger set of research initiatives undertaken by the Community College Research Center (CCRC) around the issue of measuring student success, investigating those factors – individual and institutional – that contribute to or detract from success, and assisting institutions and state community college systems in developing their capacity to meet student goals for success. (see e.g. T. Bailey, Calcagno, Jenkins, Kienzl, & Leinbach, In Press; T. R. Bailey & Alfonso, 2005; T. R. Bailey et al., 2005; Crosta, Jenkins, & Bailey, Forthcoming; Jenkins, 2006; Prince & Jenkins, 2005). The research described here uses econometric models to study pathways and outcomes of older students. As described in the methods sections, the pathway measures are defined from the student context – i.e., who the student is

(demographically and economically) and from where the student is coming (educational background).

After a brief review of the relevant literature, we enumerate the general research questions that we addressed. As indicated below, we used student unit record datasets from the state systems of Florida and Washington. The features of each dataset allowed us to ask different, but highly complementary questions about older students in community colleges. We present separately the studies with the two different state datasets. For each state, we describe the dataset and methodology used, followed by the findings and conclusions in response to the research questions. A final report summary draws general conclusions from both studies and describes other related work, current and planned, that comprise the larger research agenda of CCRC.

Literature Review

College completion and drop out rates have long been a central preoccupation of research on higher education. The general consensus among educators and researchers is that students who have stronger high school records, who come from higher income families, whose parents also went to college, who do not delay college entry after high school, who attend full time and receive some form of aid, and who do not interrupt their college studies are more likely to graduate. The most widely used conceptual frameworks of persistence and completion developed by education researchers are based on Tinto's *Student Integration Model* (1993) and Bean's *Student Attrition Model* (1985). The central implication of their models is that institutions should try to foster the academic and social engagement of their students in and with the college in order to maximize persistence and retention rates.[4] Bean and Metzner (1985) provide a theoretical framework maintaining that nontraditional students (older, part-time, and commuter students) are more negatively impacted by environmental factors than positively impacted by social and academic integration, and therefore, are more likely to interrupt and drop out than are traditional students.

Research on determinants of college drop out and degree completion using econometric models is relatively new. The literature on college completion has focused on students of traditional college age who enroll at baccalaureate institutions (R. Ehrenberg, 2004). Turner (2004) provides a comprehensive analysis of the gap between college enrollment and completion and identifies the universe of possible explanations. Manski and Wise (1983) and Light and Strayer (2000) provide a micro-level analysis of how four-year students and institutional characteristics affect a student's probability to graduate, while Dynarski (2003) presents suggestive evidence that financial aid has a causal impact on completion. The link between enrollment in two-year institutions and the probability of completing a four-year degree has been studied by Ehrenberg and Smith (2004) and Sandy et al.(In press). Rouse (1995) and Bailey et al. (In Press) have analyzed the effect of community colleges and their characteristics on degree attainment. None of these studies, however, have looked at enrollment pathways or intermediate

[4] These models have generated an immense amount of research that has been thoroughly summarized by Pascarella and Terenzini (2005).

educational outcomes such as credit attainment and retention and how these affect the final educational or economic outcomes of community college students.

Most of the studies that have analyzed these datasets focus on baccalaureate attainment, although some examine the effect of attending a community college on the probability of earning a bachelor's degree (see Adelman, 1999; Adelman, 2003; Cabrera, Burkum, & La Nasa, 2003). One exception is a recent study by CCRC (Alfonso et al., 2005) that used the 1989-94 BPS survey to examine the characteristics and outcomes of students in community college occupational programs. The findings from that study suggest that students who were 26 or older in their first year of enrollment earn certificates or degrees and transfer at lower rates than do their younger peers, although the effect of age is not always statistically significant.

This and other studies of educational attainment by undergraduate students focus on the effects of student characteristics and enrollment patterns on degree attainment. Recently, researchers have asked how such outcomes are affected by the characteristics, policies and practices of the institutions they attend. Again, most of this research has been conducted on baccalaureate-granting institutions (see e.g. Titus, 2004, In Press), although CCRC researchers have recently analyzed the effects of institutional characteristics on community college student degree outcomes using a dataset that incorporates institutional characteristics from the Integrated Postsecondary Education Data System (IPEDS) and student characteristics and outcomes from NELS (T. Bailey et al., In Press).

While studies relying on national surveys have yielded rich insights into patterns of undergraduate student persistence and attainment, the data they employ have limitations for use in studying community colleges and their students. For example, over a third of students in community college college-credit programs are over 24 years of age. Yet, as indicated, NELS only has postsecondary enrollment data through 2000 for its sample of individuals who were eighth graders in 1988. Hence, it can be used only to analyze the course-taking behavior of students until they are about 26 years old, thus, missing any ongoing enrollment beyond this age and excluding completely those students who first enroll in college when they are older. And while the BPS surveys are based on a nationally representative sample of all first-time college students, they do not include college transcript information and therefore have limited use in charting student course-taking behavior.

None of the NCES national surveys contain information about community college students in adult literacy programs, which include ABE, ESL, and GED preparation. To the extent that such surveys include data on employment and earnings of respondents (as in the case of NELS), such information tends to be limited to a point in time. Hence, these data cannot be used to measure changes in job status and earnings over time or to examine the interplay between employment and college attendance. Finally, none of the national surveys have sufficient data to allow for conclusions about colleges and students in particular states, even though state policies vary and may, as a recent CCRC study suggests (T. Bailey et al., In Press), have considerable bearing on institutional performance and student outcomes.

Research Questions

The data from Florida and Washington that we used in this study do not have the limitations of the national survey data and enable us to deepen the insights gleaned from analysis of national datasets such as NELS and BPS. Both of the states shared with CCRC demographic and longitudinal data on representative cohorts of first-time community college students. We used these data to examine the experience and outcomes of cohorts of older community college students in the two states and, specifically, to answer the following research questions:

1) What are the critical filter points at which older community college students tend to flounder and drop out?

2) What pathways are associated with higher rates of degree completion among older community college students?

3) What other demographic and background characteristics have a significant impact on the educational outcomes of older students?

4) How does enrollment in ABE, ESL, GED preparation, or developmental education affect outcomes for older students?

5) What are the labor market outcomes of a community college education for older students and what pathways lead most readily to family-supporting incomes for these students?

Florida: Determinants of Older Students' Completion and Persistence

Research has consistently shown that when older students enroll in postsecondary education they are less likely to complete a degree or certificate (S. Choy, 2002; S. P. Choy & Premo, 1995). This has been accepted as more or less conventional wisdom, presumably because of the many characteristics of older students that negatively impact enrollment patterns, enrollment intensity, and the probability of completing a degree or certificate.

In this study, we show that age of entrance is not by itself an impediment to student success. Previous research findings that age of entrance is a disadvantage have suffered from at least two limitations. First is that the methods used by these earlier studies are not designed to handle dynamic characteristics of the higher education process, especially differential enrollment patterns between older and younger students, but also time-varying covariates, time-varying effects and censoring cases. Second is the failure of these studies to account adequately for lower math skills of older students; that is, older students graduate less, not simply because "they are older", but rather because they have been away from the formal education system for some time and need to refresh their math skills. We directly compare educational outcomes of older community college students to younger ones using a single risk discrete-time hazard model that allows us to address research questions that have not been adequately answered by previous research with data from national surveys. Administrative data from the Florida Department of Education provide us with large sample sizes and detailed information about individuals while

we control for potentially confounding impacts on outcomes of variation in state policies. Our results suggest that after controlling for differential enrollment patterns and cognitive mathematics ability, older students have a higher conditional probability of completing a degree or certificate.

Dataset

The data for this study are drawn from the unit records transcript data of nearly 42,641 first-time degree-seeking Florida college students who enrolled in a college-credit course at one of the 28 Florida community colleges in the fall of the 1998-99 academic year.[5] The dataset tracks enrollment by students at Florida community colleges through the spring of 2004.[6] It includes information on the demographic characteristics of all entering students including age, gender, race/ethnicity, previous education, and college placement test scores. It also includes basic transcript information for all students who enrolled in a college-level course at a community college in Florida, with credits attempted and completed by semester, full- or part-time enrollment status, program of study, course grades, credentials earned, and amount and type of financial aid received in the first semester.

For our study of age effects, we first restrict the sample to those students who are between the ages of 17 and 65 on September 1 of their first trimester of college (fall 1998). Often, traditional-age college students are defined between 17 and 24 while nontraditional-age students are age 25 and above. We have made an additional modification in this study to limit the younger student cohort to those who enter college between the ages of 17 and 20 while the older cohort remains those who enter between age 25 and 65.[7] Thus, we omit from the sample students who first enrolled at ages 21 to 24. This restriction addresses the fact that students who begin at, for example, age 23 would technically be older students by the third year of study. Therefore, our analysis compares students who enroll at a traditional age and remain traditional-age students for 15 of the 17 trimesters to those who enroll at an older age and remain nontraditional-age students for the entire span of data collection. All of these modifications result in a sample with 29,421 traditional-age students and 5,652 older students.

Our list of explanatory variables has some other key omissions. As discussed, studies of completion rates show, not surprisingly, that students who come from higher income families and whose parents also went to college, tend to have higher probabilities of graduation. The Florida unit record dataset does not include information on any of these socioeconomic (SES) characteristics of students, though we do include an indicator for receipt of federal financial aid (primarily Pell Grants for financially needy students) and include other variables, such as test scores, which are highly correlated with unobserved SES (see Cameron & Heckman, 1998; Heckman & Carneiro, 2003; Rothstein, 2004).

[5] We removed all students who were formerly in dual enrollment (simultaneous high school and college) programs.
[6] This amounts to 17 trimesters, where a trimester is a fall, summer, or spring term. This time span will be referred to as the event period.
[7] We lose 3,619 observations with this restriction.

Methods and Questions

Many studies use longitudinal data to estimate the probability of completing college (DesJardins, 2003). However, most of these studies only look at two points in time: entry and exit. This strategy masks fundamental variation that might explain degree completion because it is not designed to handle the dynamic nature of the higher education process. Researchers must assume that initial conditions are fixed over time. In reality, enrollment patterns and institutional practices are likely to change as time passes. The effect of covariates is likely to change during the enrollment period, but the typical methodology is not designed to handle time-varying coefficients. To overcome these limitations, we use survival analysis, or event history modeling, to incorporate the occurrence of events and changes over time. This allows us to dynamically measure effects of intermediate outcomes and educational pathways on some final outcome. This method has been used successfully in some higher education research to model retention and completion among college students (i.e. DesJardins, Ahlburg, & McCall, 1999; Scott & Kennedy, 2005) (Ishitani, 2003; Johnson, 2006).

This research makes contributions to the literature on student success in higher education by applying this method to students in community colleges rather than four-year institutions, where it has most often been applied. We also disentangle the effect of age from that of other characteristics of "nontraditional" students.

The fundamental question we seek to answer is whether educational pathways, milestones, and enrollment patterns have the same effects on the conditional probability of graduating for older students as they do for younger ones. Specifically, we determine:

1) How the attainment of certain educational milestones affects the probability of graduation for older community college students compared to traditional-age students at community colleges.

2) To what extent developmental education is a barrier to completion for older students compared to younger ones.

3) Whether interruptions in enrollment affect older students differently than traditional age community college students.

The specific statistical method we use to model outcomes of community college students is the single risk discrete-time hazard model (Allison, 1984; DesJardins, 2003; Willett & Singer, 2003). To use this model we organized the dataset into a person-period data set with a maximum of 17 observations per student – one for each trimester. Each student is only observed when she is enrolled. Time-invariant variables remain constant for each person in each period, and time-varying variables can take on different values in different time periods. Our event is completion of a degree from a community college in Florida and, in our framework, we say that each student is "at risk" of completing when she is enrolled. Once a student experiences an event, her observations in later time periods are discarded, effectively removing her from reentering the risk set. Since we have 17 trimesters of data (5 years plus 2 trimesters), we can only observe outcomes for these 17 terms, and these periods are referred to as "event time" or the "event

period." The beginning of event time is the first semester of enrollment in a Florida community college (fall 1998) and the end is spring 2004. Students who have not completed by the 17th term have unknown outcomes at the end of analysis period and thereafter.[8]

Findings

Table 1 summarizes the main variables used in the analysis. Observe that the older cohort of students has a larger proportion of females, Black, and White students. Hispanic students are more likely to be in the younger cohort. Most striking are the differences seen in attainment of a high school diploma or GED, with older students more likely to have received a nontraditional secondary credential. Lastly, there exist differences in the math and verbal test scores of older and younger students. Traditional age college students, on average, scored about 87 points higher than older students on mathematics placement exams, but scored about 29 points lower on tests of verbal skills. This discrepancy could be due to older students' being away from formal mathematics education for an extended period of time, whereas verbal scores may improve over time as vocabulary and language skills advance with age.

Also in Table 1 we present a set of student characteristics for the first trimester of college enrollment.[9] Older students were more likely to receive federal financial aid. They may be better informed about their financial aid eligibility and application processes than younger students, which may result in their having an advantage in gaining financial assistance (Seftor & Turner, 2002). Moreover, if older students are independent and have relatively low incomes, they will qualify for considerable aid (T. Kane, 1999). Although community college students of all ages often hold full-time jobs while they attend school, it seems reasonable that older students are significantly more often part-time students as they may be more entrenched in careers, financial obligations, and families. Though not shown here, older students are also more likely to be part-time in each of the 17 semesters of the event period. Consequently, they attempted fewer degree credits and developmental credits during the first term of study than did the traditional age students. We also find that in this first trimester, the older cohort was less likely than younger students to enroll in any developmental education classes although both groups have similar probabilities to enroll in developmental education in any period. Despite expectations that older students are more likely to enroll in certificate programs, which are shorter, Table 1 indicates that the difference in average program length between the cohorts is very small, suggesting that older students are actually well represented in associate degree programs. The larger standard errors (not shown) of this variable for older students indicates that although the average program lengths are similar, there is much more variation among the older students.

[8] In order to produce unbiased analyses, we must assume that the censoring due to the end of event time or due to non-enrollment is non-informative with respect to event occurrence, or in other words, students are actually still capable of graduating (Singer & Willett, 2003).

[9] These variables are all time-invariant and restricted to the first trimester of college. Some of them (tuition, full-time status, and program length) will vary over time in the hazard model.

Table 1

Descriptive Statistics Demographics and First Trimester Student Characteristics

Characteristic	Younger	Older	Difference
Female	52.38	59.34	-6.96*
Age	18.25	33.93	-15.68*
Race			
Black	16.59	18.84	-2.25*
Asian or Pacific Islander	2.86	2.25	0.61*
Hispanic	19.25	15.82	3.43*
American Indian	0.46	0.65	-0.19
White	60.48	62.31	-1.84*
Unknown Race	0.36	0.12	0.24*
US citizen	88.79	82.61	6.18*
High School Credential			
HS Diploma	85.67	68.00	17.67*
GED	6.06	26.85	-20.78*
Other HS credential	0.57	0.09	0.48*
Placement test scores (200-800 scale)			
Mathematics	415.17	327.68	87.50*
Verbal	447.38	476.00	-28.62*
Received federal aid (term 1)	26.73	35.93	-9.20*
Tuition (term 1)	1309.68	1316.47	-6.79*
Full-time (term 1)	65.55	31.00	34.55*
Program length (term 1)	60.38	58.88	1.50*
Credits enrolled (term 1)	7.66	5.58	2.09*
Credits earned (term 1)	5.76	4.50	1.26*
Developmental credits enrolled (term 1)	3.60	2.54	1.06*
Developmental credits earned (term 1)	2.52	1.85	0.67*
Total credits earned (term 1)	8.28	6.35	1.93*
Ratio total credits earned/credits enrolled (term 1)	0.72	0.78	-0.62*
Number of Observations†	29,421	5,652	

* denotes significance at 0.01, two-tailed test, unequal variances

† Sample sizes are slightly smaller for High School Credential variables due to missing information.

Table 2 shows student outcomes. The first outcome event is completion, defined as receiving a degree or certificate in one of the 17 trimesters of the event period. On average, traditional age students were more likely to complete than non-traditional age students. We also have the time-varying independent variables that are the enrollment pathways and milestones, grouped by credit completions, percentage of program completion, remedial enrollment, and retention. These represent various degrees of student success. For example, Adelman (2004) contends that the attainment of 10 credits is a major milestone that portends credential completion. The time-varying dummy variable switches to one when the student earns 10 credits and then remains on for the remainder of the event time. This allows us to see the shift in risk between students who have and have not reached this educational milestone. Notice that older students, who are more likely to enroll part-time, are less likely to reach the 10- and 20-credit milestones.

Table 2

Outcome and Educational Pathway Descriptive Statistics

Outcome / Enrollment Pathways	Younger	Older	Difference
Outcome			
Completion in 17 terms	29.92	19.04	10.88*
Nominal Credit Milestones			
Earned 10 credits	78.71	61.50	17.21*
Earned 10 non-remedial credits	70.98	53.72	17.27*
Earned 20 credits	65.47	44.55	20.92*
Earned 20 non-remedial credits	59.13	39.61	19.52*
Percentage of Program Completion			
Finished 5% of program	88.11	80.91	7.20*
Finished 15% of program	77.17	65.55	11.61*
Finished 25% of program	69.12	56.74	12.38*
Finished 50% of program	55.46	43.97	11.49*
Finished 75% of program	46.70	36.75	9.95*
Remediation			
Enrolled in remediation	61.43	60.19	1.24
Mathematics	48.82	51.61	-2.79*
Reading	34.27	21.07	13.20*
Writing	29.38	20.47	8.91*
Number of Observations	29,421	5,652	

* denotes significance at 0.01, two-tailed test, unequal variances

Recognizing that older and younger students may enroll disproportionately in programs of different lengths, we use the percentage of program completions as another measure of success. Notice that still, in all these measures, older students reach the milestones at lower rates than younger students. The final pathways measures include enrollment in any remediation courses throughout the event period and specifically enrollment in reading, writing, or mathematics remediation. In our sample, there is little difference between older and younger students in the percentage that enroll in remedial classes in general (about 60 percent each). However, older students are more likely to enroll in mathematics remediation and much less likely to require reading or writing remediation than their younger counterparts.

Figure 7 shows the empirical hazard for completion by age cohort, and it depicts in which time periods students are at the greatest and least risk of graduating. Both curves have an inverted "U" shape, which indicates that students are at less risk of graduating at the beginning and end of event time and at greatest risk of completing a degree or certificate somewhere in the middle of the 17 trimester period. [10] Younger students are at greatest risk of graduating in the 9th term, which is the summer semester in the third year of study. Nontraditional-age students have a peak in the 12th term, and their curve is flatter than the one that describes younger students. It is evident, however, that in almost every time period, the older cohort has a lower conditional probability of completing a degree.

[10] It should be noted that, due to censoring, we cannot say for sure if a trends continue downward after the 17th term. All statements made only pertain to the specified and observed event time.

Figure 7

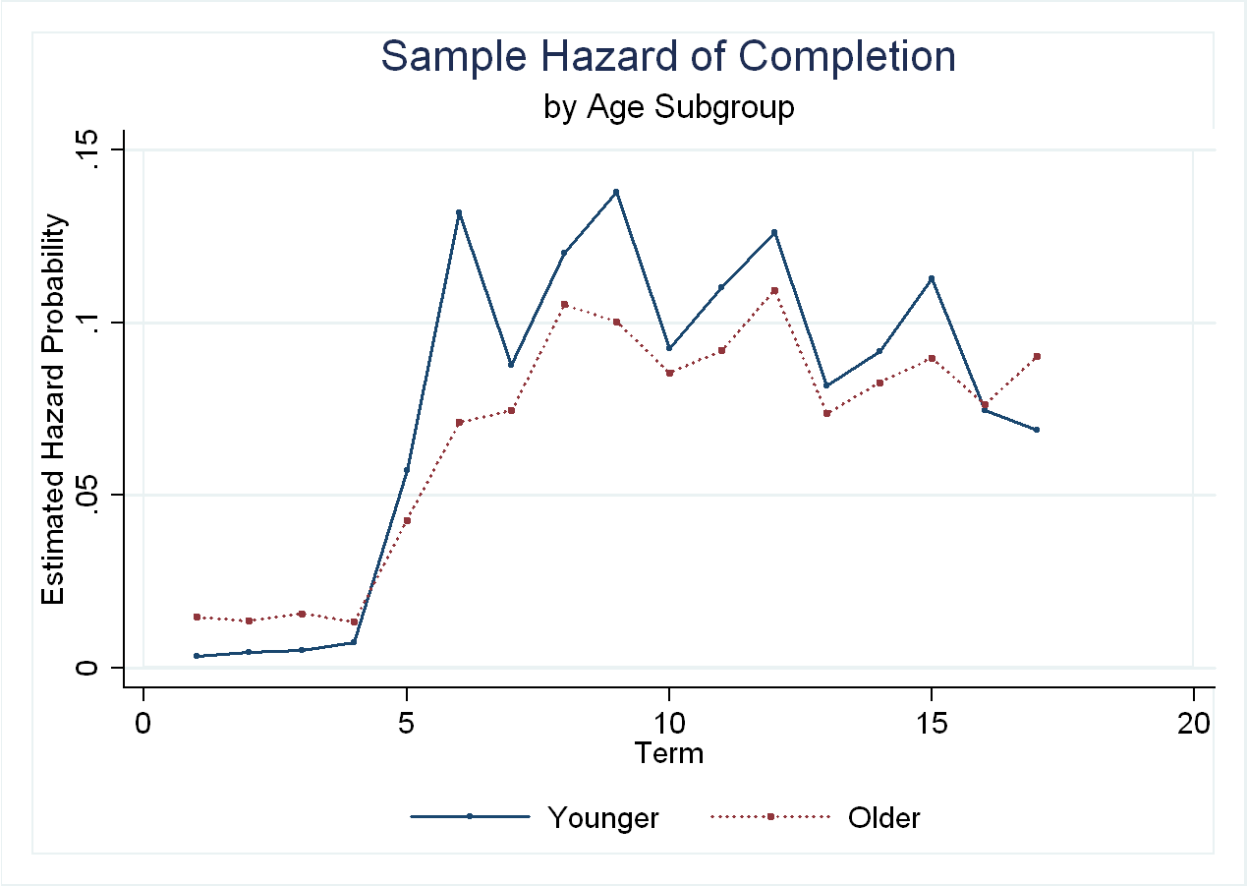


Table 3 shows the results of the estimations of several hazard models that assess whether the probability of graduating for older and younger student differs after we control for confounding variables. We began with a simple baseline function, then added predictors until we had a complete model with 17 indicator variables for effects of time or duration dependence and the time-invariant dummy variable indicating whether the student is in the older-student cohort or not. In column (1) the odds ratio of 0.93 indicates that in any given period, an older student is 0.93 times as likely to complete a degree or certificate as a student in the younger cohort. In column (2), after adding demographic variables, we observe that females are more likely to graduate each period, while Blacks, Hispanics and American Indians are less likely than Whites (the reference group) to complete a degree or certificate during the event period. Adding these controls pushes upward slightly the effect of being an older student, so that older students are expected to be 0.94 times as likely to graduate in each time period, all other factors held constant.

Column (3) and (4) add in linear and quadratic measures of cognitive ability in two steps. We first added the tests scores in English or verbal ability and we found that the odds ratio on older students is even smaller (0.80); however, when we added measures of math ability into the model, the effect of being an older student reverses its sign. After controlling for math test score, an older student is 1.24 times as likely to complete a degree as a younger student. Finally, we

include the last set of covariates in column (5). Findings from previous research indicate that we should expect full-time enrollment to increase the probability to graduate (Pascarella & Terenzini, 1991, 2005; Tinto, 1993) and our results replicate these findings. Our developmental education measure is a dummy indicating whether or not a student enrolled in any remedial classes. As expected, any stint in remediation significantly lowers the odds of graduating in any trimester since the student is not obtaining credit that counts towards the degree. However, the inclusion of these time-varying covariates does not modify the finding that when controlling for math cognitive ability, older students have a higher conditional probability of completing a degree or certificate. This finding supports the observations of faculty and researchers that older students, more so than younger ones, have a clearer sense of their objectives for going to college, take greater advantage of the resources of the institution, and they are generally not as shy about asking for help or demanding service (Cleveland-Innes, 1994; Toor, 2006). Consequently, older students are less easily discouraged or thrown off course, even though they often have more outside pressures and obligations than do younger students.

Table 3

Estimated Odds Ratios for Hazard Models, Outcome is Completion

Variables	Odds (SE) (1)	Odds (SE) (2)	Odds (SE) (3)	Odds (SE) (4)	Odds (SE) (5)	Odds (SE) (6)
Older student	0.93 (0.03)**	0.94 (0.03)	0.80 (0.03)*	1.24 (0.06)*	1.28 (0.06)*	1.31 (0.06)*
Female		1.08 (0.02)*	1.14 (0.03)*	1.25 (0.03)*	1.24 (0.03)*	1.26 (0.03)*
Black		0.48 (0.02)*	0.60 (0.02)*	0.64 (0.03)*	0.64 (0.03)*	0.65 (0.03)*
Asian		0.93 (0.06)	1.09 (0.07)	0.94 (0.06)	0.95 (0.07)	0.97 (0.07)
Hispanic		0.58 (0.02)*	0.64 (0.02)*	0.66 (0.02)*	0.68 (0.02)*	0.68 (0.02)*
American Indian		0.61 (0.10)*	0.63 (0.11)*	0.63 (0.12)	0.65 (0.12)	0.65 (0.12)
No Race		0.78 (0.14)	0.89 (0.16)	0.86 (0.17)	0.90 (0.17)	0.91 (0.18)
US Citizen		1.04 (0.04)	0.84 (0.03)*	0.96 (0.04)	0.94 (0.04)	0.93 (0.04)
High School Diploma		1.07 (0.03)	1.14 (0.04)*	1.06 (0.04)	0.99 (0.03)	1.00 (0.03)
Received Federal Aid in term 1		1.02 (0.03)	1.07 (0.03)*	1.09 (0.03)*	1.09 (0.03)*	1.09 (0.03)*
Verbal score†			1.42 (0.02)*	1.21 (0.02)*	1.11 (0.02)*	1.12 (0.02)*
Verbal score squared			0.94 (0.01)*	0.94 (0.01)*	0.95 (0.01)*	0.95 (0.01)*
Math score†				1.58 (0.03)*	1.37 (0.03)*	1.37 (0.03)*
Math score squared				0.96 (0.01)*	0.97 (0.01)*	0.97 (0.01)*
Tuition in term *j*†					1.00 (0.01)	1.00 (0.01)
Full-time in term *j*					1.44 (0.04)*	1.45 (0.04)*
Enrolled in remediation ever					0.59 (0.02)*	0.59 (0.02)*
Program length in term *j*						0.98 (0.00)*
Number of Observations	190,898	186,266	169,465	161,914	161,914	159,845
Number of Groups	35,073	34,004	30,380	29,002	29,002	27,730
Deviance (-2*Log Likelihood)	67,850	65,422	58,064	54,723	54,248	53,790
Change in Deviance††	-5.34**	-2,428*	-7,358*	-3,341*	-474*	-458*

Notes: * denotes significance at 1 percent level. Standard errors are in parenthesis. All models include 17 time dummies. † Z-standardized Variables. †† Column (1) difference tested from a model with only time dummies.

We next analyze the difference in older and younger student responses to the enrollment pathways exhibited in Table 2. To test for differences in the effects of the pathways variables, we include in the regression the older student indicator and the pathway variable as well as an interaction term that specifies the joint effect. This interaction term will tell us if there is a difference in the effect of the odds of graduating in any given period between the two groups. We use the coefficient on older students and the interaction term to compute the impact of the pathway that is specific to older students. Models for each pathway variable are estimated individually as extensions of the model in Table 3, column (6). Table 4 reports odds ratios for the substantive portion of the individual models.

The first *column* in Tables 4 indicates the *milestone or pathway that we are testing*, and each *row* represents a separate *regression* that independently tests effects of the specific pathway. Column (a) presents coefficients and standard errors for the older student dummy that indicates the direct effect of being an older student. Column (b) is the direct effect of the pathways, which is also the effect specific to younger students since we remove the effect specific to older students through an interaction term between the dummy for older students and the pathway as shown in column (c). Column (d) computes the impact of the pathway that is specific to older students by multiplying the odds ratios associated with the pathway (column (b)) and the interaction term (column (c)). Columns (e) and (f) display deviance statistics and the change in deviance that indicate improvements in the model fit compared to Table 3, column (6).

The first group of estimates concerns credit attainment. Column (a) in Table 4 reinforces our earlier claim that on average, older students are more likely to graduate in any given period as their younger counterparts, everything else held constant. Looking at the direct effect of the credit milestones (column (b)), we note that the effects are all positive and significant and the largest effect is associated with earning 20 non-remedial credits as suspected. The results suggest that, on average, earning 20 non-remedial credits increases a younger student's odds of graduating in any given trimester by a factor of 7.6 over a similar younger student who has not reached this credit milestone. The interaction coefficients yield information on whether the milestone affects older and younger students differently (column (c)). If this term is close to one, it indicates that there is not much of an observed difference between the two groups of students. Younger and older students seem to respond similarly to reaching the 10-credit milestones, and this is noted by statistically insignificant interaction terms. However, earning 20 credits may have different effects on older and younger students. This milestone is significantly less important for older students than younger ones. An older student who receives 20 non-remedial credits is only 4.9 times as likely to graduate as an older student without 20 credits, as compared to 7.6 times, which we noted for younger students. There is still a significant boost in odds of graduating for both age groups, but the milestone has a more positive effect on younger students. In fact, we found that older students are less sensitive to all the credit milestones than their younger counterparts.

The next set of estimates in Table 4 illustrates the impact on odds from completing certain percentages of the program. Like the credit milestones, the effect of the pathway grows as program percentage increases. We see interaction terms for all models that are similar in magnitude to the interaction terms estimated with the credit milestones, but only the term

indicating that a student has finished 50% of her program is significantly different from no effect. Here we see again that the impact of finishing 50% of the program on odds of graduating in any given term is smaller for older students than for younger ones, though the impact is clearly positive for both. An older student who completes 50% of her program increases her odds of graduating in any given term by a factor of 11.5 whereas a younger student increases her odds by a factor of 15.5.

Remediation measures are summarized in the last four rows of Table 4. Looking at the variable for ever enrolled in remediation (or specifically math, reading, or writing) we see that any stint in remediation significantly lowers the odds of graduating in any trimester. The interaction term indicates that remediation does affect the two cohorts differently. Younger students who enroll in remedial courses are 0.58 times as likely to graduate as a younger student who does not take these courses. Older student who need remediation change their odds of graduating in any term by 0.77 compared to older student who do not enroll in remediation. This tells us that the impact of taking developmental classes is less detrimental (and significantly so) to the probability of graduating for an older student than for a younger student. This may reflect the varying motivations and goals of older students. Older students may not let academic challenges deter them as much as younger students. Also, it may be the case that, since they have been out of school for longer, older students are more likely to need remediation because their basic skills are merely "rusty" rather than grossly deficient.

When breaking out remedial enrollment by subject area, we find that the interaction term in column (c) is only significant for mathematics remediation. This highlights the earlier findings on the link between older students and the mathematics subject area. These students are coming to college with deficient or rusty math skills that become a key barrier to their success, and greater attention to their developmental mathematics paths may be warranted.

Table 4

Estimated Odds Ratios for Hazard Models, Enrollment Pathways and Interactions

Dependent Variable: Completion	Older Cohort (S.E.)	Pathway (Impact for Younger Students) (S.E.)	Interaction (Older * Pathway) (S.E.)	Impact for Older Students	Model Fit	
					Deviance	Change in Deviance†
	(a)	(b)	(c)	(d) = (b) * (c)	(e)	(f)
Credits						
Earned 10 credits	2.019 (0.621)*	4.447 (0.536)*	0.640 (0.198)	2.846	53,827	257.9*
Earned 10 non-remedial credits	1.746 (0.418)*	4.911 (0.457)*	0.730 (0.177)	3.585	53,582	503.5*
Earned 20 credits	2.142 (0.362)*	6.737 (0.561)*	0.593 (0.103)*	3.995	53,111	974.1*
Earned 20 non-remedial credits	1.938 (0.292)*	7.595 (0.538)*	0.645 (0.100)*	4.899	52,530	1554.9*
Program percentage						
Finished 5% of program	2.080 (0.816)	2.621 (0.415)*	0.625 (0.246)	1.638	54,033	52.0*
Finished 15% of program	1.947 (0.481)*	4.108 (0.404)*	0.655 (0.163)	2.691	53,751	334.2*
Finished 25% of program	1.725 (0.333)*	6.151 (0.495)*	0.728 (0.143)	4.478	53,183	901.9*
Finished 50% of program	1.684 (0.246)*	15.463 (1.020)*	0.743 (0.112)*	11.487	50,211	3874.3*
Finished 75% of program	1.559 (0.185)*	31.496 (1.725)*	0.813 (0.102)	25.601	44,630	9455.3*
Enrolled in remediation ever	1.073 (0.086)	0.575 (0.018)*	1.333 (0.124)*	0.766	53,781	304.8*
Mathematics	1.054 (0.078)	0.592 (0.019)*	1.339 (0.118)*	0.793	53,824	261.6*
Reading	1.255 (0.063)*	0.686 (0.025)*	1.141 (0.115)	0.783	53,980	105.1*
Writing	1.243 (0.062)*	0.657 (0.023)*	1.184 (0.122)	0.778	53,939	146.0*

* denotes significance at 0.05 level. Standard errors are in parenthesis. All models include 17 time dummies and control variables included in Table 3, column (3).
† Deviance tested against Table 3, column (3)
Note: Each line is a separate regression

Conclusions

We had two important findings from this study using the discrete-time hazard model on older first-time students in Florida. First, we found that, after controlling for differential enrollment patterns and cognitive mathematics ability, older students have a higher probability of graduating in any given period than younger ones. This suggests that, once one controls for ability and enrollment patterns, age of entrance is not the barrier to degree completion that conventional wisdom would suggest.

Our second finding was that, when testing for differences between age cohorts for factors that affect community college completion, younger and older students do in fact respond differently to reaching credit milestones, taking developmental education, and interrupting enrollment. Reaching the 20-credit milestones more positively affects the probability of graduation for a younger student than for an older student. We also found that although remediation decreases the odds of graduating in any given term, older students who enroll in remediation, and specifically mathematics remediation, are *less negatively affected* than are younger ones who do the same. Clearly, the program completion milestones, though important, are not as important for older students as they are for younger students. In responding to the broad research questions we posed, we see that pathways variables seem to be less important for older students in impacting their completions, and similarly, developmental education does not seem to be as detrimental of a barrier to completion than it is for younger students.

This research suggests that older students are more persistent through the challenges of postsecondary education. Moreover, the results support testimonials that older students have a clearer sense of their objectives for going to college, they know how to navigate the educational bureaucracy, and they are generally not as shy about asking for help or demanding services. This may indicate that older students are less easily discouraged or thrown off course, even though they often have more outside pressures and obligations than do younger students.

This study using the Florida dataset investigates only older students who begin their postsecondary education in college credit classes (including remedial). Yet, many older students in particular come to community colleges to improve their basic skills education, learn English, or complete a high school credential. In many cases, their return to school is explicitly for job skills and training to improve their career and income opportunities. The data from Washington allows us to investigate the pathways and other factors that impact these students educational and economic success.

Washington: Basic Skills Student Success and Economic Outcomes

In our earlier review of the literature we indicated the need for research that disaggregates community college students by age to investigate those characteristics and pathways that lead older students to educational success. Our studies with both the Florida and Washington datasets addressed this question. The Washington dataset includes employment information for students before and after their postsecondary enrollment. With this data we are able to investigate enrollment pathways and characteristics that benefit older students economically.

Much research already exists on the economic benefits of postsecondary education and, gratefully, there recently has been greater emphasis on the outcomes for students in community colleges. These include work on both students who earn a credential and those who earn credits without a credential. Using now dated national data, Kane and Rouse (1995) found significant boosts (ranging above or below 20 percent) in earnings from community college degrees. These studies found that one year of coursework without a degree also increases earnings, though at rates of only about 5 to 10 percent. Grubb's 2002 review of other earnings literature echoed the results found by Kane and Rouse (Grubb, 2002b). Marcotte et al. (2005) updated the older research on community college students using recent data using NELS dataset and found similar, if not as strong, results for both those students earning credentials and those with a year or more of coursework. As with other studies, they found differential benefits between men and women, with the latter receiving greater income increase from their postsecondary education. One limitation of many of these studies using these longitudinal surveys is that their sample includes only young students up to their 20s or makes no distinction between older and younger students.

In contrast, Leigh and Gill (1997) looked at adult students in community colleges, though they investigated returning students who already had some postsecondary enrollment. Among this population, additional education at the community college level provided significant income boosts for both those who earn credentials and those who don't during their community college enrollment. Similarly, using data from Washington state in the early 1990s, Jacobson et al. (2004) looked at the economic returns to community college for "displaced workers" and found significant earnings boosts for those who had at least one year of enrollment, with higher returns for those enrolled in vocational and technical programs than those in academic ones. Importantly, they found that higher levels of credit accumulation (without a credential) garnered higher earnings, though the benefits trail off after about the 40 credit level (L. Jacobson et al., 2004, p. 289). The boosts are in comparison to those displaced workers who did not enroll in postsecondary education (a selection limitation that also afflicts our research). Unfortunately, they did not differentiate students by previous levels of education in their OLS regressions.

This study includes distinctions which previous research was unable to make. We have very recent data that includes enrollment information from the late 1990s and early 2000s and income data through 2003. We look exclusively at older students and only those with no previous postsecondary education. Thus, we are not conflating findings of older and younger students and those who already have some higher education. These represent students with gross educational deficiencies as well as economic challenges, and are very different populations than their younger peers who are also first-time students and those older students returning to higher education for a second time. As described below, we disaggregate further this older cohort by educational need.

Our study using the Washington State Board for Community and Technical College dataset is also a follow-up to the recent work of Prince and Jenkins (2005). They used the same dataset to track the educational attainment and earnings outcomes over five years of adult community college students 25 or older with a high school education or less. Using a set of descriptive tables, they concluded that students taking at least a year of college-level classes and earning a credential gain a substantial boost in earnings over those who do not. The study also

provided a description of sub-populations of these students by academic background (high school diploma, GED, no high school credential, or English-deficient), with their credit accumulation and enrollment outcomes over five years. While informative, the conclusions were not based on a rigorous analysis of the data to determine statistical significance.

The current research extends the Prince and Jenkins paper in many ways. While we use the typology based on educational background of older first-time postsecondary students in community colleges, we also exclude all students under 25 so that we are looking exclusively at older students.[11] Therefore, we obtain a very clean sample of older students for our descriptions of this population. We then used a set of ordinary least squares (OLS) regressions to explore in more depth the various student characteristics and educational pathways that significantly impact students' educational and economic outcomes for each of the four types of older first-time students. Consequently, we are able to identify those factors that significantly contribute or detract from these students ability to reach an educational milestone such as earning a credential, completing a specific educational plan, or earning a threshold number of credits. Similarly, the regressions allowed us to identify those demographic characteristics and educational pathway factors that significantly impact post-enrollment wages.

As Prince and Jenkins described, many of these students do not get very far in their education at community colleges. However, those who do make progress in the form of at least a year in college and earning a credential receive "a substantial boost in earnings" (Prince & Jenkins, 2005, p. 21). Our study tests that conclusion through a rigorous statistical analysis and determines precisely what amount and level of coursework provides a statistically significant increase earnings. Furthermore, we assess what specific educational pathways and milestones contribute to economically beneficial outcomes. We also wanted to see what characteristics of these older students make it more likely that a student would experience educational and economic benefits. That is, not only did we investigate what point students needed to get to in their education to see significant economic benefit, but also what educational pathways got them to that point, and what types of older students in basic skills and other classes were more likely to persist to that point at which they would experience economic benefit from their postsecondary education. Finally, as noted, many of these older students were not enrolled in basic skills, but already had a high school diploma or completed a GED. We wanted to observe the characteristics and postsecondary educational pathways that allowed these students to gain economic benefit from their education. We expect this group is more likely to complete college credentials, such as certificates or associate degrees, and would, according to the literature, see even larger increases in their income.

Dataset

The Washington state dataset includes 29,777 students aged 25 or older with no more than a high school diploma who enrolled for the first time in a Washington state community or technical college during either the 1996-97 or 1997-98 school year. For each student we have demographic information (gender, race/ethnicity, age, family status), as well as level of previous education, quarter by quarter enrollment information for five years from the start of the academic year, and any credentials earned over the five years. The enrollment data also includes the type

[11] Prince and Jenkins included students under 25 who did not have a high school credential (or GED).

of student based on program in which enrolled (transfer, workforce, basic skills, or other), type and amount of financial aid received, and credits (including basic skills, English as a second language, and college remedial) and grades earned. By keying on social security number (not available to us), Washington merged the student information with employment information from state unemployment insurance (UI) wage record data. The UI data includes employment status and quarterly earnings for at least two years prior to and five years after the student's initial enrollment.[12]

We divided the students into one of four analytical groups, depending on their level of education and initial enrollment, as follows (the number of students in each group are included in parentheses):

- ESL If the student enrolled in any ESL class. (10,907)
- ABE If the student enrolled in adult basic education and/or self-reported s/he had less than a high school education. (10,304)
- GED If the student self-reported s/he had a GED and did not enroll in adult basic education during the five year period. (2,176)
- HS If the student self-reported s/he had a high school diploma and did not enroll in adult basic education during the five year period. (6,390)

As suggested by Figures 4 and 5 from the BPS survey, we expect that each of these populations will have different reasons for enrolling and educational expectations upon entry into a community college. While GED and HS students might be expected to have similar plans and expectations, these populations were separated for analytical purposes to see if the difference in their past educational pathways might reveal differences in postsecondary enrollment pathways and outcomes.

Methods and Questions

Our analysis begins with a set of descriptive statistics that include demographic characteristics, credits accumulated, transition rates from basic skills to developmental education and credit programs, and completion rates by credential earned. Labor market outcome descriptive statistics are also shown. These statistics stand alone for their own informative value, and were used to guide the development of models for our multivariate analyses. Though our research population was older students, because of the characteristics of these students, the descriptive statistics also provide important information about low-income students, students of color, and other populations with disproportionately low success rates. We identified these additional groups using dummy variables in the multivariate regressions.

We used an ordinary least squares (OLS) regression to estimate student outcomes for each population of students. As we are particularly interested in the student enrollment pathways

[12] Some students were still enrolled five years after initial enrollment. We dropped from the income analysis all students for whom we did not have at least two years of post-enrollment wage data.

and individual characteristics (including employment) that contribute to or detract from successful student outcomes, our models incorporated this information as either dummy, discrete, or continuous explanatory (independent) variables. We developed several models with different outcome (dependent) variables. We introduced the demographic and enrollment characteristics in a stepwise fashion into the regressions. At the simplest level, the model uses credentials earned (degrees and certificates) as outcomes. These outcomes can be a challenge for students who start in adult basic education or ESL classes to achieve. Therefore, models that assess these students' completion of basic education or a defined educational plan as successful outcomes are tested. A final outcome measure will be credits accumulated since other studies have shown that threshold levels of enrollment without a credential have proven beneficial to community college students. The models that use credits earned as their dependent variable will help particularly to identify the "filter points" at which different types of community college students drop out without completing a credential program. To measure labor market outcomes for students we use quarterly earnings data from Washington state as the dependent variable in the regressions. This will include earnings before, during and after postsecondary enrollment, so our dependent income variables can be both the absolute value after postsecondary enrollment as well as the change in earnings from before to after postsecondary enrollment (as a means of measuring more directly the impact of education on income).

Specifically, we investigated the following questions:

1) What individual and pathways characteristics distinguish students in ESL and ABE who go on from these programs to take at least one college-credit course (including developmental)? Of those who go on to college, in what sorts of programs do they enroll?

2) Among all students who enter college-level courses, what individual and pathways characteristics distinguish those who are able to earn credentials? What impact do working and earning have on credential completion?

3) Are there measurable employment and earnings gains from completion of ABE, ESL, GED, or college-level programs?

Findings

Table 5 provides a summary of the characteristics of these older students and the four sub-populations. Key numbers are highlighted here. Since we restricted our population to students who are 25 or older, our mean age is high for most expectations of PSE students. Thus, the average age is 34 and a half (with a standard deviation of six and a half), which are consistent across all four student types. Women comprise small majorities in all categories with the exception of GED students, where they are 49 percent. Not surprisingly, 54 percent of the ESL students are Hispanic (another 20 percent are Asian). In this population, White students are disproportionately represented among the better educated students, where they represent about 80 percent of each of those students with GEDs and high school diplomas (Whites comprise just slightly over half of the whole older student population in this dataset). The majority of students (about 60 percent) have dependents, a number which is generally consistent across all four

groups, and not surprising for the study population. However, being a single parent has greater variation among the groups: About one quarter of all ABE and GED students, less than 20 percent of HS students, and only around 10 percent of ESL students are in this category.

Among the employment and income information, we included a variable for whether the student had a social security number. This represents a proxy for their documented status in the United States and our ability to link the student to the UI data for employment information. Observe that ESL students are the population with the lowest proportion having SSNs. Because of limitations to type of employment, we would expect that undocumented students are likely to have lower incomes than those who are documented. Since our income information depends on the UI data, we may overstate the average income for students. As measures of socioeconomic status (SES) we had three different variables: Low-wage earner, welfare recipient, and working poor community. Low-wage earners are those whose annual earnings prior to college enrollment (the year three-to-six quarters prior to enrollment) were 60 percent or less of the state average wage. Welfare recipient was determined by an SSN match with TANF records three quarters prior to enrollment. Working poor communities are for the student's ZIP code and defined according to the following criteria. If the proportion of persons in the ZIP code at or below 200 percent of the poverty line is equal to or greater than that for the county as a whole, then the ZIP code is a working poor community.[13] For all three of these measures, relatively large proportions of these older students exhibit economic hardships (those with HS or GED less so and ESL students particularly so). The ESL group has comparatively lower rates of welfare recipients, though that is probably because of the high numbers of students without SSNs and therefore welfare status could not be determined or for which they are not eligible. Variations also exist among the proportion who worked during their first quarter of enrollment. While about half of the HS group worked, only 41 percent of GED students did, slightly less than 40 percent of ESL students, and only about 29 percent of ABE students did. In such cases, the vast majority of all populations worked full-time if they were working.

[13] Washington SBCTC and State Office of Fiscal Management definitions.

Table 5

Demographic Characteristics of Washington State Community and Technical College Students, Aged 25 Years or More, Who Started with a High School Education or Less in 1996-97 or 1997-98

Student Characteristics	All Students	ESL	ABE	GED	HS
	% or mean	% or mean	% or mean	% or mean	% or mean
Age, Gender, and Race/Ethnicity					
Age	34.5	34.5	34.6	34.3	34.5
Female	51.3%	52.6%	50.7%	49.2%	50.8%
African American	6.7%	3.6%	9.1%	4.8%	8.4%
Asian	9.8%	19.6%	4.9%	2.3%	4.3%
Hispanic	25.9%	54.1%	15.5%	5.4%	4.3%
Native American	2.6%	0.2%	4.9%	4.2%	2.3%
Other Race	2.3%	3.9%	1.5%	1.4%	1.5%
White	52.7%	18.6%	64.0%	81.9%	79.2%
Family Status					
Have Dependents	59.7%	63.6%	56.9%	60.3%	57.8%
Single Parent	18.5%	10.1%	24.7%	25.6%	19.5%
Employment and Income Status					
Have SSN	91.7%	81.6%	95.7%	99.8%	99.7%
Welfare Recipient	17.7%	16.9%	22.5%	19.9%	10.4%
Working in First Quarter	38.3%	38.6%	28.7%	40.9%	50.6%
Working Fulltime in First Quarter	29.8%	31.6%	22.4%	28.6%	38.1%
Working Poor Community	67.2%	77.2%	64.4%	58.5%	57.5%
Low-Wage Earner	74.3%	86.3%	77.3%	73.0%	61.7%
Purpose for Attending College					
Transfer	8.7%	2.2%	3.4%	19.9%	24.4%
Workforce	48.9%	39.3%	37.0%	79.0%	74.1%
Basic Skills	41.3%	58.0%	58.0%	0.0%	0.0%
Other	1.1%	0.4%	1.6%	1.1%	1.5%
Plan to Attend at least 1 Year	31.9%	17.4%	24.5%	54.6%	55.9%

Source: Washington State Board for Community and Technical Colleges. Authors' calculations.

The dataset included a derived variable identifying each student by his or her purpose for attending, based on the type of program in which enrolled. These include transfer, workforce, basic skills, or other. Predictably, nearly 60 percent of the ESL and ABE students are defined as basic skills students, while most of the remainder are workforce. In contrast, three-fourths of HS and 80 percent of GED students are workforce while the remainder are mostly students whose objective is transfer. Significantly, well over half (about 55 percent) of both HS and GED students reported planning to attend for at least one year (or more), while only one-fourth of the ABE students and 17 percent of the ESL students. The enrollment characteristics described herein are the first clue to the distinct educational expectations of the different populations.

Table 6, showing enrollment characteristics and educational outcomes, exhibit patterns expected based on student educational backgrounds. Observe that, not unexpectedly, the HS and GED populations are enrolling exclusively in either college-level courses or developmental education, and are much more likely to be full-time students in the first quarter than are ESL or ABE students.[14]

[14] The rates of developmental education enrollment among this sample of GED and HS students in Washington is much lower than for older students in the Florida sample. This is most likely because the Washington sample includes all first-time students, whereas the Florida sample was restricted to degree-seeking students, among whom those with deficient skills are more likely to be required to enroll in remediation. There may also be different state and institutional policies on enrollment in developmental education.

The five-year credit accumulation and completion rates are quite low, with the GED and HS students showing generally more success in these areas. Even among the latter populations, students average only a little more than two quarters worth of FTE credits over the five-year period of observation.[15] Observe, for example, that over 96 percent of all ESL students had no reported outcome. Unfortunately, there is no way to determine if these students completed a sequence of ESL courses or even a set of prescribed workforce training courses.[16] Even ABE students who presumably are studying for their GED, actually obtain their GED in 13 percent of the cases. Among all these older students, over four out of five conclude their enrollment with no measurable outcome. The low proportion of measurable outcomes makes a challenge for assessing success or the pathway and other determinants of that success. Therefore, in our multivariate analysis, we rely heavily on credit accumulation as a measure of success. In particular, for ESL and ABE students, enrollment in college level credits (including developmental) would signify completion (or adequate progress to succeed in classes at the next level) of their basic skills classes.

Observe in Table 6 the low rates of financial aid receipt, particularly among ESL and ABE students, who are among the financially most needy students. Financial aid includes aid at all levels (institution, state, federal) and in all forms (grants, loans, work-study), which makes the low rates even more disturbing. The rates are favorable compared with those for older students in the Florida dataset, and this may be because the measure of aid included many more sources than that for Florida, which was restricted to Federal Pell grants. The low rates for ESL and ABE students are likely due to ineligibility for aid for students enrolled in basic skills courses. While the $25 per semester cost for ESL in Washington community colleges is very modest, the opportunity costs of time and lost wages, as well as books, transport, child care, and other services can easily make the cost of education prohibitive for many.[17]

[15] Washington community colleges operate on the quarter system, in which 15 credits is equal to one FTE quarter.
[16] Some workforce training programs are listed as a "plan," which is awarded under certain specific regulations for retraining, specialized non-credential training, or career advancement training (but not upgrading training).
[17] The Washington legislature is attempting to redress this problem and passed in spring 2006 an Opportunity Grant program to take effect in the 2006-07 academic year that will provide financial assistance for tuition and other expenses needed to support low-income adults in workforce education. Significantly, students are eligible regardless of the number of classes in which they are enrolled.

Table 6

Enrollment Characteristics of Washington State Community and Technical College Students, Aged 25 Years or More, Who Started with a High School Education or Less in 1996-97 or 1997-98					
Enrollment Characteristics	**All Students**	**ESL**	**ABE**	**GED**	**HS**
	% or mean	**% or mean**	**% or mean**	**% or mean**	**% or mean**
Types of Courses in First Quarter of Enrollment					
Any Developmental Education	11.4%	0.4%	3.3%	36.9%	34.7%
Developmental Math	8.3%	0.1%	1.4%	28.8%	26.2%
Developmental English	5.8%	0.1%	2.0%	18.8%	17.1%
ESL	36.3%	96.8%	2.3%	0.0%	0.1%
GED	15.8%	1.7%	43.8%	0.0%	0.0%
ABE	10.1%	1.1%	28.0%	0.0%	0.0%
Any College Level Credit	27.2%	0.9%	9.9%	82.1%	81.5%
College Level Credit: Math	1.3%	0.0%	0.1%	5.0%	4.2%
College Level Credit: English	5.2%	0.1%	0.7%	16.7%	17.2%
Full-time Student	22.9%	14.0%	13.2%	50.3%	44.4%
Outcome Achieved Anytime					
Associate's Degree	3.9%	0.6%	1.3%	8.9%	12.1%
Certificate	5.1%	2.0%	3.3%	9.8%	11.7%
Apprenticeship	0.0%	0.0%	0.0%	0.0%	0.0%
High School Completion	0.3%	0.0%	0.8%	0.0%	0.0%
GED	4.6%	0.6%	12.7%	0.0%	0.0%
Plan	4.9%	0.6%	13.6%	0.0%	0.0%
Total Credits Earned					
Any College Level Credit	14.35	2.97	7.29	33.72	38.53
College Level Credit: Math	0.41	0.08	0.17	0.86	1.19
College Level Credit: English	1.25	0.15	0.57	2.96	3.66
Any Developmental Education	2.05	0.63	1.16	4.30	5.13
ABE	0.33	0.19	0.77	0.00	0.00
GED	0.43	0.16	1.08	0.00	0.00
ESL	2.06	5.39	0.23	0.00	0.00
Other Enrollment					
Start Fall Quarter	34.4%	30.1%	32.1%	42.0%	42.8%
Developmental Education Course(s) Anytime	20.2%	4.7%	12.3%	49.2%	49.3%
Plan To Attend At Least 1 Year	31.9%	17.4%	24.5%	54.6%	55.9%
Financial Aid					
Ever Received Financial Aid	14.5%	1.3%	6.8%	48.8%	37.7%
Received Financial Aid in First Quarter	10.7%	0.5%	3.4%	40.3%	29.6%
Amount Received in First Quarter	$143.32	$3.939	$40.042	$613.296	$387.732
Amount Received in First Quarter, If Ever Re	$1,344.15	$795.549	$1,178.831	$1,519.967	$1,308.826

Source: Washington State Board for Community and Technical Colleges. Authors' calculations.

Finally, in Table 7 we have average quarterly income for the student populations. All values are adjusted to 2005 dollars. We calculate the average by taking the mean income for six quarters (or the number of quarters actually worked) in the third through eighth quarter before and after enrollment.[18] In all cases post-enrollment means are far higher than pre-enrollment

[18] We measure income up to three quarters prior to enrollment to avoid the Ashenfelter dip, which observes that earnings fall shortly before postsecondary participation.

income, with ESL students experiencing the highest absolute and proportional jump. In general, we found that the higher the level of education, the higher the average income.

Table 7

Employment Characteristics of Washington State Community and Technical College Students, Aged 25 Years or More, Who Started with a High School Education or Less in 1996-97 or 1997-98					
Employment Characteristics	**All Students**	**ESL**	**ABE**	**GED**	**HS**
Average Quarterly Income Before Enrollment	$3,013.39	$1,921.80	$2,779.95	$3,483.99	$4,517.67
Average Quarterly Income After Enrollment	$4,208.65	$3,861.85	$3,658.93	$4,350.88	$5,410.92
Average Difference	$1,177.01	$1,912.09	$868.64	$914.90	$869.08

Source: Washington State Board for Community and Technical Colleges. Authors' calculations.

The descriptive statistics indicate that this older population of first-time students is a population with many responsibilities, facing economic challenges, and with low levels of education. These populations are ones for whom persistence and success as measured by the completion of credentials may be a challenge. Therefore, instead of using credential completion as the only standard of success, we also measure intermediate outcomes that may lead toward a credential (or transfer), but for the student may be a milestone achievement in itself. The achievement of such a milestone may improve their job prospects, raise their income, or even allow them to converse more fluently on their job – any of which might be a success from the student's perspective, even if not so among conventional measures of students success. As we indicated at the beginning of this paper, many students (particularly older students) do not intend to earn credentials, but just accumulate skills or knowledge during their postsecondary enrollment. Whether this is a wise economic choice for this set of older first-time students is a major part of this study. This is also an important issue from a policy perspective, as it helps institutions identify minimum levels of achievement that provide significant benefits to students for whom the long road to attaining a credential may be too daunting of a task when beginning in PSE for the first time.

Multivariate Analysis

We now turn to our multivariate analysis to help us identify those factors that enable older first-time students with limited educational backgrounds to reach important milestones. That is, what are their "pathways to success"? Beyond educational attainment, can we identify a critical threshold (milestone) which students must reach to gain significant economic benefit from their education? Tables 8 through 11 list the final stage results (after inclusion of all the independent variables) of our OLS regressions on educational outcomes. Tables 12 and 13 provided analyses of the economic outcomes. We briefly summarize the important findings here, looking at each older student group separately.

Because of low rates of completion of GED programs, plans, certificates and associate degrees among ESL students, these models did not produce meaningful results that could be used. Two percent or less of all students among the sample of over 10,000 ESL students

accomplished any of these outcomes. Similarly, the ABE students had low rates of completion for these outcomes, though 13 percent did earn a GED and 3 percent earned certificates during their PSE. Here we will interpret the model only for credits earned, as that also acts as a proxy for completion of ESL or ABE program course completion. The demographic characteristics of female, Hispanic, and African American (for ESL) are all highly negative factors in college-level credit accumulation – decreasing the credits earned by small but significant percentages. The latter two are not surprising, given that the reference population, White students, tend to exhibit more postsecondary success than minority populations. However, the results for females are surprising. Women generally outperform men on all postsecondary education measures. One likely explanation is that women in these programs are less inclined toward accumulating college credits beyond the basic skills.

Looking at the results collectively for completion of any college level or developmental credits among the ESL and ABE groups, we see strongly significant positive effects for students in transfer or workforce (occupational degree) programs and among those who plan to attend for one year or more. [19] Additionally, for both populations, enrolling full-time in the first quarter increases ones likelihood of earning credits, and working full-time in the first quarter decreases that likelihood. A long-term commitment to education, even if it does not significantly improve a student's chances of earning a credential does seem to help students at least achieve an intermediate milestone in their education.

[19] We ignored the strong positive impacts of Pell grant receipt in all the models since only those students enrolled in college-level courses can receive this type of aid.

Table 8

Regression Coefficients For ESL Students For Educational Outcomes					
Variable	**GED**	**Plan**	**Certificate**	**Associate Degree**	**Any Develop-mental or College Credits**
Female	0.001	0.006**	0.000	-0.001	0.028***
	(0.00)	(0.00)	(0.00)	(0.003)	(0.009)
Hispanic	0.010**	-0.009**	-0.023***	-0.010***	-0.099***
	(0.004)	(0.004)	(0.006)	(0.004)	(0.013)
African American	0.003	-0.009	-0.001	-0.019***	-0.048**
	(0.007)	(0.007)	(0.011)	(0.007)	(0.022)
Asian	-0.004	-0.010**	-0.001	-0.005	-0.044***
	(0.004)	(0.004)	(0.007)	(0.004)	(0.014)
Other Race	-0.003	-0.001	0.019*	0.008	0.007
	(0.007)	(0.007)	(0.011)	(0.007)	(0.023)
Dependents	0.000	0.000	0.003	-0.002	-0.023**
	(0.003)	(0.003)	(0.004)	(0.003)	(0.009)
Single Parent	0.002	-0.005	-0.006	-0.002	0.004
	(0.004)	(0.005)	(0.007)	(0.004)	(0.014)
Welfare	-0.007**	0.015***	0.019***	0.007**	0.007
	(0.004)	(0.004)	(0.006)	(0.004)	(0.012)
Working Poor Community	0.002	-0.004	-0.010**	0.000	-0.042***
	(0.003)	(0.003)	(0.005)	(0.003)	(0.011)
Pell Grant	0.045***	-0.011	0.306***	0.157***	0.763***
	(0.014)	(0.015)	(0.023)	(0.014)	(0.045)
Transfer	-0.005	0.002	-0.002	0.017**	0.141***
	(0.008)	(0.008)	(0.013)	(0.008)	(0.027)
Workforce	-0.004*	0.001	0.008**	0.005**	0.006
	(0.002)	(0.003)	-0.004	(0.002)	(0.008)
Plan to Attend 1 Year or More	0.012***	0.000	0.009*	0.003	0.063***
	(0.003)	(0.004)	(0.005)	(0.003)	(0.011)
Enrolled Fulltime, First Quarter	0.003	-0.006*	0.008	0.000	0.043***
	(0.003)	(0.004)	(0.005)	(0.003)	(0.011)
Dev. Education, First Quarter	-0.025	0.053***	-0.051*	-0.024	
	(0.017)	(0.018)	(0.027)	(0.017)	
Working Fulltime, First Quarter	(0.002)	0.003	-0.007	-0.003	-0.034***
	(0.003)	(0.003)	(0.005)	(0.003)	(0.010)
Amount of Income, First Quarter	-0.000*	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.006	0.013**	0.030***	0.014***	0.193***
	(0.005)	(0.005)	(0.008)	(0.005)	(0.017)
Observations	**5524**	**5524**	**5524**	**5524**	**5524**
R-squared	**0.010**	**0.010**	**0.057**	**0.038**	**0.110**

Notes: (1) Standard errors in parentheses

(2) * significant at 10%; ** significant at 5%; *** significant at 1%

Source: Washington State Board for Community and Technical Colleges. Authors' calculations.

Table 9

Regression Coefficients For ABE Students For Educational Outcomes					
Variable	**GED**	**Plan**	**Certificate**	**Associate Degree**	**Any Develop-mental or College Credits**
Female	0.026***	0.002	0.019***	0.006*	0.052***
	(0.01)	(0.00)	(0.01)	(0.003)	(0.011)
Hispanic	-0.080***	0.006*	-0.011*	-0.010**	-0.106***
	(0.012)	(0.003)	(0.006)	(0.004)	(0.015)
African American	-0.098***	0.009**	0.008	-0.011**	-0.010
	(0.015)	(0.004)	(0.008)	(0.005)	(0.018)
Asian	-0.105***	-0.005	0.021**	-0.007	0.008
	(0.020)	(0.006)	(0.010)	(0.007)	(0.024)
Other Race	-0.061***	0.002	0.004	-0.002	-0.014
	(0.017)	(0.005)	(0.009)	(0.006)	(0.020)
Dependents	0.019*	0.006**	0.005	0.000	-0.018
	(0.010)	(0.003)	(0.005)	(0.004)	(0.012)
Single Parent	-0.008	-0.003	-0.002	-0.004	0.002
	(0.012)	(0.003)	(0.006)	(0.004)	(0.014)
Welfare	-0.007	0.004	-0.006	-0.004	-0.032**
	(0.011)	(0.003)	(0.006)	(0.004)	(0.014)
Working Poor Community	-0.009	-0.002	-0.006	0.003	-0.028***
	(0.009)	(0.002)	(0.005)	(0.003)	(0.011)
Pell Grant	0.011	0.001	0.157***	0.070***	0.514***
	(0.020)	(0.005)	(0.010)	(0.007)	(0.023)
Transfer	-0.037	0.004	-0.002	0.017**	0.314***
	(0.023)	(0.007)	(0.012)	(0.008)	(0.028)
Workforce	-0.066***	0.003	0.026***	0.009***	0.227***
	(0.009)	(0.002)	-0.005	(0.003)	(0.011)
Plan to Attend 1 Year or More	-0.018*	0.001	0.001	0.016***	0.060***
	(0.010)	(0.003)	(0.005)	(0.004)	(0.012)
Enrolled Fulltime, First Quarter	0.018	0.013***	-0.003	0.016***	0.097***
	(0.012)	(0.003)	(0.006)	(0.004)	(0.015)
Dev. Education, First Quarter	-0.083***	-0.010	-0.030**	-0.023***	
	(0.024)	(0.007)	(0.012)	(0.009)	
Working Fulltime, First Quarter	0.019*	-0.002	-0.022***	0.004	-0.009
	(0.012)	(0.003)	(0.006)	(0.004)	(0.014)
Amount of Income, First Quarter	-0.000**	0.000**	0.000	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.187***	0.000	0.012**	0.001	0.167***
	(0.011)	(0.003)	(0.006)	(0.004)	(0.013)
Observations	**6773**	**6773**	**6773**	**6773**	**6773**
R-squared	**0.031**	**0.006**	**0.057**	**0.032**	**0.214**

Notes: (1) Standard errors in parentheses

(2) * significant at 10%; ** significant at 5%; *** significant at 1%

Source: Washington State Board for Community and Technical Colleges. Authors' calculations.

Table 10

Regression Coefficients For GED Students For Educational Outcomes				
Variable	**Plan**	**Certificate**	**Associate Degree**	**Any Develop-mental or College Credits**
Female	0.021***	0.004	-0.001	-0.004
	(0.01)	(0.01)	(0.014)	(0.008)
Hispanic	-0.019	0.016	0.016	0.001
	(0.017)	(0.027)	(0.029)	(0.017)
African American	0.030*	-0.036	-0.046	-0.010
	(0.018)	(0.029)	(0.031)	(0.018)
Asian	-0.039	0.057	0.087**	0.031
	(0.025)	(0.040)	(0.043)	(0.025)
Other Race	-0.031*	-0.030	-0.020	-0.017
	(0.016)	(0.026)	(0.028)	(0.016)
Dependents	-0.002	-0.004	0.012	-0.004
	(0.009)	(0.014)	(0.015)	(0.009)
Single Parent	0.029***	-0.012	0.014	0.005
	(0.011)	(0.018)	(0.019)	(0.011)
Welfare	-0.023**	0.027	-0.085***	-0.006
	(0.011)	(0.018)	(0.019)	(0.011)
Working Poor Community	0.000	-0.014	0.007	-0.001
	(0.008)	(0.012)	(0.013)	(0.008)
Pell Grant	-0.032***	0.029*	0.030*	0.019**
	(0.009)	(0.015)	(0.016)	(0.009)
Transfer	0.017	0.039	0.025	-0.010
	(0.038)	(0.061)	(0.065)	(0.038)
Workforce	0.014	0.090	0.042	-0.032
	(0.037)	(0.060)	(0.064)	(0.037)
Plan to Attend 1 Year or More	-0.025***	-0.056***	0.058***	0.020**
	(0.008)	(0.013)	(0.014)	(0.008)
Enrolled Fulltime, First Quarter	0.050***	0.003	0.052***	0.008
	(0.009)	(0.014)	(0.015)	(0.009)
Dev. Education, First Quarter	-0.032***	-0.064***	0.018	
	(0.009)	(0.014)	(0.015)	
Working Fulltime, First Quarter	-0.025**	-0.036**	-0.025	-0.001
	(0.011)	(0.018)	(0.019)	(0.011)
Amount of Income, First Quarter	0.000	-0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.024	0.071	-0.016	0.984***
	(0.038)	(0.061)	(0.065)	(0.038)
Observations	**1953**	**1953**	**1953**	**1953**
R-squared	**0.052**	**0.058**	**0.048**	**0.019**

Notes: (1) Standard errors in parentheses

(2) * significant at 10%; ** significant at 5%; *** significant at 1%

Source: Washington State Board for Community and Technical Colleges. Authors' calculations.

Table 11

Regression Coefficients For HS Students All For Educational Outcomes				
Variable	**Plan**	**Certificate**	**Associate Degree**	**Any Develop-mental or College Credits**
Female	-0.001	0.006	0.007	-0.005
	(0.01)	(0.01)	(0.010)	(0.004)
Hispanic	0.035***	0.006	-0.025	-0.031***
	(0.012)	(0.020)	(0.023)	(0.009)
African American	-0.002	0.032**	-0.069***	-0.030***
	(0.009)	(0.015)	(0.017)	(0.007)
Asian	0.002	0.064***	-0.036	-0.036***
	(0.012)	(0.021)	(0.023)	(0.009)
Other Race	0.011	-0.016	-0.048**	-0.005
	(0.013)	(0.021)	(0.024)	(0.009)
Dependents	0.003	0.005	0.020**	-0.001
	(0.005)	(0.009)	(0.010)	(0.004)
Single Parent	0.017**	0.002	-0.037***	0.000
	(0.007)	(0.012)	(0.014)	(0.005)
Welfare	-0.005	0.008	-0.066***	-0.019***
	(0.009)	(0.015)	(0.016)	(0.007)
Working Poor Community	-0.005	-0.008	-0.021**	-0.007*
	(0.005)	(0.008)	(0.009)	(0.004)
Pell Grant	-0.020***	0.014	0.086***	0.015***
	(0.006)	(0.011)	(0.012)	(0.005)
Transfer	-0.003	-0.092**	-0.050	0.023
	(0.022)	(0.036)	(0.040)	(0.016)
Workforce	0.004	-0.031	-0.020	0.002
	(0.021)	(0.035)	(0.039)	(0.016)
Plan to Attend 1 Year or More	-0.033***	-0.035***	0.076***	0.007*
	(0.005)	(0.009)	(0.010)	(0.004)
Enrolled Fulltime, First Quarter	0.020***	0.046***	0.055***	0.006
	(0.006)	(0.009)	(0.011)	(0.004)
Dev. Education, First Quarter	-0.018***	-0.071***	0.035***	
	(0.005)	(0.009)	(0.010)	
Working Fulltime, First Quarter	-0.029***	-0.025**	-0.028**	0.003
	(0.006)	(0.010)	(0.012)	(0.005)
Amount of Income, First Quarter	0.000	-0.000**	-0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.056***	0.171***	0.088**	0.979***
	(0.022)	(0.036)	(0.041)	(0.016)
Observations	**5119**	**5119**	**5119**	**5119**
R-squared	**0.029**	**0.050**	**0.070**	**0.021**

Notes: (1) Standard errors in parentheses

(2) * significant at 10%; ** significant at 5%; *** significant at 1%

Source: Washington State Board for Community and Technical Colleges. Authors' calculations.

Tables 12 and 13 provide the OLS regression results for post-education income and the difference in income from before and after their enrollment for the four student groups. The after education income calculations were done using the average quarterly income over six quarters starting in the third quarter following the last period in which a student is enrolled. This provides an initial attempt to answer the question about measurable economic gains for these adult students completing educational programs or reaching other milestones in their education.

Prior to discussing impacts of education, we provide some other observations. In the measure of post-education income (Table 12), observe that being female significantly lowered quarterly income earnings by well over $1,000 for all groups. This highlights the persistent gender difference in income discrepancy, even in this case of older workers with lower levels of education. In fact, these discrepancies are generally greater at lower income levels (Marcotte et al., 2005). Notice that in the before and after income comparison (Table 13), the female effect disappears for all groups except for the ESL population, where the difference is still significant, but greatly diminished. Although this population of women have lower incomes regardless of educational achievement, at least when compared to men, they also experience a boost from their postsecondary education.

Notice also the significantly lower levels of absolute post-education income for those persons on welfare – a rate which is particularly high for those GED and HS populations. This is not unexpected. However, when looking at income before and after income differences, the welfare-recipient characteristic produces a strongly significant and very high boost in income differential (from $800 to $1400 per quarter for different older student groups). Enrollment in postsecondary education appears to be a significant benefit to these students.

Among the educational achievements that most benefit these older students' economic returns to their education, earning a credential stands out as strongly significant, with high financial returns for all groups of students. The absolute income benefit is over $1,000 per quarter for the basic skills students in ESL and ABE and lower, but still strongly significant, for those students coming in with GEDs or high school diplomas. When comparing the before and after incomes of certificate-earners, the benefits are even greater, when compared to the students within each peer group who do not earn a credential. Therefore, they earn significantly more in absolute terms and in terms relative to their pre-education income. The significance of earning a credential is well-known, but we now know that it is important even for incumbent workers coming back for further education. Furthermore, for students who already have a diploma or GED and are starting their enrollment in college level or developmental courses (and not basic skills), one year of credit does not provide significant boost to absolute earnings (and only a small significant differential earnings for HS students when comparing the pre- and post-education earnings in Table 13). In contrast to the findings of Grubb (2002a), Kane and Rouse (1995), and Marcotte et al. (2005), all of whom saw significant economic benefit to a year or more of postsecondary education without a credential, for our older population here this does not seem to be the case. However, in contrast, a year of education without a credential provides significant boost for both the ESL and ABE populations, although the actual financial boost is only about half that for those earning certificates. Perhaps students with very low levels of education who are able to complete their basic skills courses and make important inroads into

college level (or developmental) coursework are able to obtain skills and knowledge that propel them to levels beyond their peers who may complete fewer or no college credits.

Table 12

Regression Coefficients For All Four Groups For Post-Education Income				
Variable	**ESL**	**ABE**	**GED**	**HS**
Female	-1,443.964***	-1,069.039***	-1,489.113***	-1,317.786***
	(93.827)	(95.697)	(203.224)	(140.282)
Hispanic	-834.409***	491.075***	538.787	-156.029
	(141.329)	(131.030)	(437.986)	(335.330)
African American	-17.217	-255.869	-147.831	-1,127.245***
	(248.688)	(157.226)	(454.030)	(246.105)
Asian	124.842	1,388.110***	1,150.857*	188.194
	(152.329)	(214.259)	(638.770)	(338.499)
Other Race	153.548	-287.068	-18.200	-438.273
	(251.536)	(180.702)	(407.320)	(356.148)
Dependents	304.022***	1,256.849***	1,037.006***	-55.706
	(101.119)	(106.587)	(222.402)	(150.102)
Single Parent	-102.269	-497.622***	-70.747	-393.139**
	(158.483)	(125.987)	(272.975)	(199.347)
Welfare	-545.732***	-1,040.521***	-1,616.080***	-1,437.803***
	(128.720)	(117.155)	(271.712)	(229.966)
Working Poor Community	89.381	-260.613***	-753.973***	-630.887***
	(115.467)	(94.157)	(191.869)	(135.419)
Highest Outcome: Associate Degree	319.174	759.819	1,226.818***	265.818
	(741.419)	(466.247)	(437.447)	(282.404)
Highest Outcome: Certificate	1,058.897***	1,092.741***	979.280***	653.464***
	(397.099)	(291.486)	(365.111)	(242.863)
Highest Outcome: Plan	471.591	457.063	-72.551	355.456
	(526.979)	(503.092)	(587.946)	(378.137)
Highest Outcome: GED	428.389	273.677**		
	(517.808)	(129.700)		
Credit Equivalent Years	483.333***	409.580***	(118.161)	71.293
(Total Dev. and College Credits ÷ 45)	(171.577)	(109.724)	(128.949)	(92.590)
Constant	4,719.863***	3,372.110***	5,137.845***	6,575.148***
	(170.672)	(102.154)	(215.974)	(160.582)
Observations	**5148**	**6550**	**1892**	**4882**
R-squared	**0.065**	**0.078**	**0.081**	**0.053**

Notes: (1) Standard errors in parentheses
(2) * significant at 10%; ** significant at 5%; *** significant at 1%

Source: Washington State Board for Community and Technical Colleges. Authors' calculations.

Table 13

Regression Coefficients For All Four Groups For the Difference in Pre- and Post- Education Income				
Variable	**ESL**	**ABE**	**GED**	**HS**
Female	-544.214***	232.562**	-165.105	32.862
	(95.398)	(95.577)	(195.824)	(138.181)
Hispanic	-2,223.906***	307.288**	236.614	163.038
	(143.695)	(130.866)	(422.038)	(330.307)
African American	-281.211	211.878	507.465	-150.077
	(252.852)	(157.029)	(437.497)	(242.419)
Asian	-758.978***	1,139.510***	1,260.444**	354.076
	(154.879)	(213.991)	(615.511)	(333.428)
Other Race	-476.600*	249.111	85.105	-78.304
	(255.747)	(180.476)	(392.488)	(350.813)
Dependents	-184.362*	284.190***	48.909	-206.577
	(102.812)	(106.453)	(214.303)	(147.854)
Single Parent	-136.474	-348.019***	180.413	-202.789
	(161.136)	(125.829)	(263.035)	(196.361)
Welfare	810.753***	1,005.164***	841.122***	1,428.269***
	(130.875)	(117.008)	(261.818)	(226.521)
Working Poor Community	131.014	-130.001	-353.192*	-243.343*
	(117.400)	(94.039)	(184.882)	(133.390)
Highest Outcome: Associate Degree	1049.127	1,185.724**	640.927	76.837
	(753.832)	(465.663)	(421.519)	(278.174)
Highest Outcome: Certificate	1,018.320**	1,306.164***	744.394**	711.321***
	(403.747)	(291.121)	(351.816)	(239.225)
Highest Outcome: Plan	487.732	160.661	111.284	119.900
	(535.802)	(502.462)	(566.537)	(372.473)
Highest Outcome: GED	1,040.926**	286.319**		
	(526.477)	(129.538)		
Credit Equivalent Years	384.055**	-108.573	103.140	240.118***
(Total Dev. and College Credits ÷ 45)	(174.449)	(109.587)	(124.254)	(91.203)
Constant	3,223.787***	154.979	729.022***	636.724***
	(173.530)	(102.026)	(208.110)	(158.176)
Observations	**5148**	**6550**	**1892**	**4882**
R-squared	**0.124**	**0.028**	**0.021**	**0.016**

Notes: (1) Standard errors in parentheses
(2) * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Washington State Board for Community and Technical Colleges. Authors' calculations.

Conclusions

Research is scarce on the educational pathways of students through community colleges. This is particularly true of students who start when they are older than the traditional aged college student. Therefore, while we know much about factors impacting all student outcomes in postsecondary education, most research has failed to make a distinction by age in identifying these factors. We used two state datasets of individual student longitudinal enrollment data to answer questions about students aged 25 and above who are enrolled for the first time in postsecondary education. Working on the established premise that older students are different than their younger peers in their individual background and educational characteristics, reasons for attending, and pathways through higher education, we wanted to study this population to

identify the factors that uniquely impact their educational and economic outcomes. While our analyses featured older students enrolled in postsecondary college-level credits, we also recognized that many students returning to education after working are not standard students in credit classes (or even developmental education) and degree programs. For vast numbers of older students, their enrollment in postsecondary education is often for basic skills or English as a second language. In some states such as Washington these students enroll in community colleges. While some of these students may expect to move beyond basic skills training to enroll in college-level classes, others are enrolled solely for the basic skills to improve their employment prospects and income. Therefore, not only does age set this group of students apart from other community college students, but their program and objectives are distinct from those older students in credit coursework. Our research took account of these differences between older and younger students and within older student populations themselves.

Using the Florida dataset to compare student outcomes and factors that contribute to or detract from student outcomes, we clearly found differences between age cohorts for first-time degree-seeking students. Specifically, the pathways variables, such as retention and program completion, are less important factors for impacting older student completion than they are for younger students. Similarly, enrollment in developmental education does not seem to be as detrimental to completion for older students as it is for younger students. Significantly, we found that after controlling for ability measures, age of enrollment is not the barrier to earning a credential as postulated.

Using the Washington dataset, we did not compare older and younger students, but looked exclusively at older students. This time, we observed differences between those enrolled in community colleges for basic skills education and those enrolled in college level courses for the first time. These students need to be measured with different educational outcomes, or milestones, to assess their levels of success. As expected, with different types of students, and different milestones to observe, the salient factors that help or deter students to those milestones are different for the different groups of students. As for benefiting economically from their postsecondary education, all four groups of older students gain clear benefits from credentials, a finding that concurs with established research on studies of all students. However, for those students entering with the lowest levels of education (ABE and ESL students), even without earning a credential, completion of their basic skills program followed by a substantial enrollment in college level courses (including remediation) also provides a significant boost in income. Therefore, it may be important to use other milestones to measure educational success since not all pathways lead to credentials and for many students, benefits accrue even with non-credential achievements.

Based upon the specific findings in this research, we see that older students exhibit a tendency to persist through the educational challenges and bumps in the road that they encounter. Where younger students who fail to achieve intermediate milestones in a timely manner may more easily be discouraged and tend to drop out, older students exhibit greater resilience. Older students' persistence is a logical outgrowth of their conscious decision to return to school under often burdensome financial and opportunity costs. Our findings from this research reinforces this notion. While adult students exhibit personal commitment and motivation to persist in school, they are more likely to encounter financial, family, and other challenges, which may

derail their educational aspirations. Financial support for indirect educational expenses (such as child care and transportation), rather than merely tuition and the like, can help non-traditional students in their efforts to continue their education.[20] Furthermore, as the Washington data showed, those students who indicated a commitment to enroll for longer than one year were more likely to have measurable outcomes, and more likely to have higher outcomes, than those without such intentions. With effective advising and program enrollments, colleges can promote long-term commitment among students, which is especially beneficial to those basic skills students in greater academic need.

In addition to the substantive findings of this research, our work has shown the value of the datasets and analytical methods used. Specifically, the use of state longitudinal student unit record data is invaluable for any meaningful studies of student outcomes. As our own and others' work has shown, national surveys are valuable sources for observing enrollment patterns, student outcomes, and the many background characteristics that influence those for students. Yet, the national survey datasets have insufficient sample size to disaggregate student populations by multiple characteristics due to the limited sample sizes. This is particularly true when studying community college students where the surveys such as BPS (2,968) and NELS (4,411) had relatively small sample sizes for students who ever attended a community colleges. Data collected by states from their community colleges includes all students ever enrolled in those colleges, and keeps track of their enrollment throughout their enrollment in the system (and not just over a period specified by the survey). In most cases, this data can include transcript-level detailed course information that can be exploited to observe course patterns and grades. In states like Washington, where students in adult basic skills classes attend community colleges, we have access to data on postsecondary students enrolled in non-college courses. While many states still have rudimentary student datasets that would be incapable of supporting this type of detailed analysis, the work of high profile national projects, such as those sponsored by the Lumina Foundation (Achieving the Dream) and the Ford Foundation (Bridges to Opportunity) are promoting the development of state (and institutional) data systems for research purposes. Until such time as a national student unit record system is established, the state datasets provide a most valuable source for longitudinal student data.

The work with the Florida dataset showed the power of using an event history model to identify pathways effects on student outcomes. It was instrumental in discovering that pathways and milestones, while important, are not as significant for this older population. The value of this method is that it allows time-varying variables to take on different values in each period of observation. This is highly important in tracking educational progress for many characteristics – intensity of enrollment, working while enrolled, the accumulation of credits, and others – that may change with each new period of enrollment. And those conditions impact directly the outcome probabilities for students. It was evident that taking into account these non-static factors enabled us to observe differences between student populations. This type of work can be used in observations of other student populations, such as minority and immigrant populations, students in different programs, etc. We expect to perform a similar analysis with the Washington

[20] An example from Washington state is the recently approved Opportunity Grants program, which provide part-time students in community colleges, including those in basic skills, financial aid for a variety of direct and indirect educational expenses.

dataset on our four different student populations to observe the impacts of time-variant variables on their educational outcomes.

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References

Adelman, C. (1999). *Answers in the Tool Box: Academic Intensity, Attendance Patterns, and Bachelor's Degree Attainment*. Washington, DC: U.S. Department of Education.

Adelman, C. (2003, November 13). *Replicating the "tool box" hypotheses: Challenges in the data sets.* Paper presented at the Annual Meeting of the Association for the Study of Higher Education, Portland, OR.

Adelman, C. (2004). *Principal indicators of student academic histories in postsecondary education, 1972-2000*. Washington, DC: U.S. Department of Education.

Adelman, C. (2005). *Moving into town—and moving on: The community college in the lives of traditional-age students*. Washington, DC: U.S. Department of Education.

Alfonso, M., Bailey, T., & Scott, M. (2005). The educational outcomes of occupational sub-baccalaureate students: Evidence from the 1990s. *Economics of Education Review, 24*(2), 197-212.

Allison, P. D. (1984). *Event history analysis: Regression for longitudinal event data* (Vol. 07-046). Newbury Park, CA: Sage.

Bailey, T., Calcagno, J. C., Jenkins, D., Kienzl, G. S., & Leinbach, T. (In Press). Community college student success: What institutional characteristics make a difference? *Economics of Education Review*.

Bailey, T. R., & Alfonso, M. (2005). *Paths to persistence: An analysis of research on program effectiveness at community colleges*. Indianapolis, IN: Lumina Foundation for Education.

Bailey, T. R., Jenkins, D., & Leinbach, D. T. (2005). *Is student success labeled institutional failure? Student goals and graduation rates in the accountability debate at community colleges* (No. 1 CCRC Working Paper). New York: Columbia University, Teachers College, Community College Research Center.

Bailey, T. R., Leinbach, D. T., Scott, M., Alfonso, M., Kienzl, G. S., & Kennedy, B. (2003). *The characteristics of occupational sub-baccalaureate students entering the new millennium*.Unpublished manuscript, Community College Research Center, Teachers College, Columbia University.

Bean, J., & Metzner, B. (1985). A Conceptual model of nontraditional undergraduate student attrition. *Review of Educational Research, 55*, 485-540.

Bean, J. P. (1985). Interaction effects based on class level in an explanatory model of college student dropout syndrome. *American Educational Research Journal, 22*(1), 35-64.

Becker, G. (1964). *Human capital*. New York, NY: Columbia University Press.

Beder, H. (1999). *The outcomes and impacts of adult literacy education in the United States*. Cambridge, MA: National Center for the Study of Adult Learning and Literacy.

Bos, J. M. (1996). *Effects of education and educational credentials on the earnings of economically disadvantaged young mothers*. New York: MDRC.

Bos, J. M., Scrivener, S., Snipes, J., & Hamilton, G. (2002). *Improving basic skills: The effects of adult education in welfare-to-work programs*. New York: MDRC.

Cabrera, A. F., Burkum, K. R., & La Nasa, S. M. (2003, November 13). *Pathways to a four-year degree: Determinants of degree completion among socioeconomically disadvantaged students.* Paper presented at the Annual Meeting of the Association for the Study of Higher Education, Portland, OR.

Cameron, S., & Heckman, J. (1998). Life Cycle Schooling and Dynamic Selection Bias: Models and Evidence for Five Cohorts of American Males. *Journal of Political Economy, 106*(2), 262-333.

Card, D., & Lemieux, T. (2001). Can falling supply explain the rising return to college for younger men? A cohort-based analysis. *Quarterly Journal of Economics, 116*(2), 705-746.

Chisman, F. (2004). *Adult education and literacy and community colleges in Kentucky*. New York: Council for Advancement of Adult Literacy.

Choy, S. (2002). *Nontraditional undergraduates: Findings from the condition of education, 2002*. Washington, DC: National Center for Education Statistics.

Choy, S. P., & Premo, M. K. (1995). *Profile of Older Undergraduates: 1989-90. Statistical Analysis Report* (Statistical Data No. Eric No. ED382122). Berkeley, CA.: MPR Associates.

Cleveland-Innes, M. (1994). Adult student drop-out at postsecondary institutions. *Review of Higher Education, 17*(4), 423-445.

Cohen, A. M., & Brawer, F. B. (1996). *The American Community College* (Third ed.). San Francisco, CA: Jossey-Bass.

Crosta, P., Jenkins, D., & Bailey, T. (Forthcoming). *Comparing alternative measures of community college performance* (No. 31 CCRC Brief). New York: Columbia University, Teachers College, Community College Research Center.

D'Amico, D. (1997). *Adult education and welfare to work initiatives: A review of research, practice and policy*. Washington, DC: National Institute for Literacy.

D'Amico, D. (1999). *Politics, policy, practice and personal responsibility: Adult education in an era of welfare reform*. Cambridge, MA: National Center for the Study of Adult Learning and Literacy.

DesJardins, S. L. (2003). Event history methods: Conceptual issues and an application to student departure from college. In J. Smart (Ed.), *Higher Education: Handbook of Theory and Research XVIII* (pp. 421-471).

DesJardins, S. L., Ahlburg, D. A., & McCall, B. P. (1999). An event history model of student departure. *Economics of Education Review, 18*, 375-390.

Dynarski, S. (2003). Does aid matter? Measuring the effect of student aid on college attendance and completion. *American Economic Review, 93*(1), 279-288.

Ehrenberg, R. (2004). Econometric studies in higher education. *Journal of Econometrics, 121*(1), 19-37.

Ehrenberg, R. G., & Smith, C. L. (2004). Analyzing the success of student transitions from 2- to 4-year institutions within a state. *Economics of Education Review, 23*(1), 11-28.

Grubb, W. N. (2002a). Learning and earning in the middle, part I: National studies of pre-baccalaureate education. *Economics of Education Review, 21*(4), 299-321.

Grubb, W. N. (2002b). Learning and earning in the middle, part II: State and local studies of pre-baccalaureate education. *Economics of Education Review, 21*(5), 401-414.

Heckman, J., & Carneiro, P. (2003). Human capital policy. In B. Friedman (Ed.), *Inequality in America: What role for human capital policies?* (pp. 77-240). Cambridge, MA: MIT Press.

Horn, L., & Carroll, C. D. (1996). *Nontraditional undergraduates: Trends in enrollment from 1986 to 1992 and persistence and attainment among 1989-90 beginning postsecondary students* (No. NCES 97-578). Washington, DC: National Center for Education Statistics.

Horn, L., & Nevill, S. (2006). *Profile of Undergraduates in U.S. Postsecondary Education Institutions: 2003–04: With a Special Analysis of Community College Students (NCES 2006-184).* Washington, DC: U.S. Department of Education.

Jacobson, L., LaLonde, R., & Sullivan, D. (2004). Estimating the returns to community college schooling for displaced workers. *Journal of Econometrics, 125*(1), 271-304.

Jacobson, L., LaLonde, R., & Sullivan, D. (2005). The impact of community college retraining on older displaced workers: Should we teach old dogs new tricks? *Industrial and Labor Relations Review, 58*(3), 398-415.

Jenkins, D. (2003). *The potential of community colleges as bridges to opportunity for the disadvantaged: Can it be achieved on a large scale?* New York: Columbia University, Teachers College, Community College Research Center.

Jenkins, D. (2006). *What community college policies and practices are effective in promoting student success? A study of high- and low-impact institutions*. New York: Columbia University, Teachers College, Community College Research Center.

Jobs for the Future. (2004). *Breaking through: Helping low-skilled adults enter and succeed in college and careers*. Boston, MA: Author.

Kane, T. (1999). *The Price of Admission: Rethinking How Americans Pay for College*. Washington: Brookings Institution Press.

Kane, T. J., & Rouse, C. E. (1995). Labor market returns to two- and four-year colleges: Is a credit a credit and do degrees matter? *American Economic Review, 85*(3), 600-614.

Kane, T. J., & Rouse, C. E. (1999). The community college: Educating students at the margin between college and work. *Journal of Economic Perspectives, 13*(1), 63-84.

Katz, L., & Autor, D. (1999). Changes in the wage structure and earnings inequality. In D. Card & O. Ashenfelter (Eds.), *Handbook of Labor Economics* (Vol. 3, pp. 1463-1555). Amsterdam: Elsevier Science.

Leigh, D. E., & Gill, A. (1997). Labor market returns to community colleges: Evidence for returning adults. *Journal of Human Resources, 32*(2), 334-353.

Light, A., & Strayer, W. (2000). Determinants of college completion: School quality or student ability? *Journal of Human Resources, 35*(2), 299-332.

Manski, C., & Wise, D. (1983). *College choice in America*. Cambridge, MA: Harvard University.

Marcotte, D. E., Bailey, T. R., Borkoski, C., & Kienzl, G. S. (2005). The returns of a community college education: Evidence from the National Education Longitudinal Survey. *Educational Evaluation and Policy Analysis, 27*(2), 157-175.

Morest, V. S. (2003). *The role of community colleges in state adult education systems: A national analysis*. New York: The Council for Advancement of Adult Literacy.

Pascarella, E., & Terenzini, P. (1991). *How college affects students: Findings and insights from twenty years of research*. San Francisco, CA: Jossey-Bass Publishers.

Pascarella, E., & Terenzini, P. (2005). *How college affects students: A third decade of research* (Vol. 2). San Francisco: Jossey-Bass.

Prince, D., & Jenkins, D. (2005). *Building pathways to success for low-skill adult students: Lessons for community college policy and practice from a statewide longitudinal tracking study*. New York: Community College Research Center, Teachers College, Columbia University.

Rothstein, J. (2004). College performance predictions and the SAT. *Journal of Econometrics, 121*(1-2), 297-317.

Rouse, C. E. (1995). Democratization or diversion? The effect of community colleges on educational attainment. *Journal of Business and Economic Statistics, 13*(2), 217-224.

Sandy, J., Gonzalez, A., & Hilmer, M. (In press). Alternative paths to college completion: Effect of attending a 2-year school on the probability of completing a 4-year degree. *Economics of Education Review*.

Scott, M., & Kennedy, B. (2005). Pitfalls in pathways: Some perspectives on competing risks event history analysis in education research. *Journal of Educational and Behavioral Statistics, 30*(4), 413-442.

Seftor, N., & Turner, S. (2002). Back to School: Federal Student Aid Policy and Adult College Age Enrollment. *Journal of Human Resources, 37*(2), 336-352.

Strawn, J. (1998). *Beyond job search or basic education: Rethinking the role of skills in welfare reform*. Washington, DC: Center for Law and Social Policy.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago, IL: University of Chicago Press.

Titus, M. (2004). An examination of the influence of institutional context on student persistence at 4-year colleges and universities: A multilevel approach. *Research in Higher Education, 45*(7), 673-700.

Titus, M. (In Press). Understanding the influence of financial context of institutions on student persistence at 4-year colleges and universities: A multilevel approach. *Journal of Higher Education*.

Toor, R. (2006). Bridging the classroom generation gap. *Chronicle of Higher Education, 52*(28), B5.

Turner, S. (2004). Going to College and Finishing College: Explaining Different Educational Outcomes. In C. Hoxby (Ed.), *College Choice: The Economics of Where to Go, When to Go, and How to Pay for It*. Chicago: University of Chicago Press.

U.S. Department of Education. (1998). *Descriptive summary of 1995-96 Beginning Postsecondary Students, with profiles of students entering 2- and 4-year institutions, NCES 1999-030*. Retrieved June 7, 2006, from http://nces.ed.gov/pubs99/1999030.pdf

U.S. Department of Education. (2003a). Beginning postsecondary students longitudinal study second follow-up data files and ECB, *NCES 2003-160 [Data CD-ROM]*. Washington, DC: National Center for Education Statistics.

U.S. Department of Education. (2003b). Integrated postsecondary education data system, *Fall enrollment survey 2002 [Data file]*. Washington, DC: National Center for Education Statistics.

Van Duzer, C., Peyton, J. K., & Comings, J. (1998). *Research agenda for adult literacy*. Washington, DC: Center for Applied Linguistics.

Walker, S., & Strawn, C. (2004). *Oregon shines! Adult education and literacy in Oregon community colleges*. New York: Council for Advancement of Adult Literacy.

Willett, J. B., & Singer, J. D. (2003). *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence*. New York: Oxford University Press.

Follow-Up and Future Studies of Community College Student Pathways and Outcomes Using State Datasets

With the AIR/NPEC grant the Community College Research Center (CCRC) has been able to dedicate significant time working with large state student longitudinal datasets. For a number of years analyzing state data has been a goal of CCRC because the state datasets contain both a rich set of information on student pathways and a sufficient number of cases to disaggregate students by many characteristics. After a number of studies using the national sample surveys done by the National Center for Education Statistics (such as NELS, BPS, and NPSAS), we acknowledged their limitations for the investigation of community college student pathways and for the study of particular student populations (such as older students). Drawing on the experience gained from the research described here, CCRC has established plans to continue several strands of research using state datasets, including a commitment to continue working with those from Florida and Washington, as well as other sources.

We requested and have already received updates from the Florida Department of Education to the dataset we used in this study. The dataset has been supplemented with both additional variables and additional cohorts of students, which will allow us to expand the older student analysis and investigate other topics. First, we will continue our work on older students by doing a study restricted exclusively to the factors impacting the transfer of older students to other institutions within the Florida state system. A second study, not limited to investigations of older students, will be the effects of remedial education for students in the Florida community college system. The dataset we have from Florida includes test scores used by the state to determine enrollment in remedial education at community colleges. By comparing the educational outcomes of students whose test scores fall just above the cut-off for remediation (and thus are not required to enroll in remediation) with those whose scores fall just below the cut-off (and thus required to take remediation), and assuming that ability differences between these students are minimal and insignificant, we can assess the longitudinal impact of the developmental education classes in which the students enroll. Our final study with this Florida data will be an investigation of the impacts of financial aid on student success. We will look specifically at the Florida Bright Futures Scholarship Program, which offers financial aid to attend a Florida postsecondary institution for academically strong yet financially needy Florida high school graduates. Using cohorts from the mid-1990s, we will be able to track the educational outcomes of these students for several years. We will use similar single risk discrete-time hazard models as employed here, as well as more traditional methods of multivariate analysis in the study with these datasets. We have found the state of Florida data to be very comprehensive and accurate, and the personnel in the state offices with whom we have worked very supportive of our use of the data. We expect to continue to produce fruitful research from the data that the Florida Department of Education makes available to us.

We will soon receive a completely new dataset that includes both Florida high school student enrollment and Florida two-year and four-year postsecondary student enrollment data. This dataset was requested to carry out a study funded by the U.S. Department of Education's Occupational, Vocational, and Adult Education office on dual enrollment students. As part of this study, we will also be using a dataset provided by the City University of New York (CUNY)

system of their students who participated in CUNY's dual enrollment program in conjunction with New York City public schools. CCRC has extensive experience working with CUNY data. The institutional research offices at CUNY maintain an excellent dataset with complete term-by-term student data dating back to at least 1990. As it includes data only within the CUNY system, transfers outside of the system are not available, but it does have complete tracking of students within the system among all 19 two-year and four-colleges in CUNY. This project, which will begin in the summer of 2006, will compare postsecondary educational achievement and outcomes of students who participated in dual enrollment with those who did not participate. We will also investigate specifically the postsecondary experiences of those who enroll in vocational (as opposed to academic) dual enrollment programs. CCRC has studied dual enrollment policies nationwide and investigated particular state programs, but this will be our initial quantitative assessment of two such programs. To our knowledge, this will be the first longitudinal study using sophisticated multivariate tools on a wide scale to measure the educational impacts on students who participated in dual enrollment programs.

We will continue to work with the Washington state dataset to develop the analyses presented in this report. We will exploit this dataset that merges student transcript data with pre- and post-enrollment employment data to expand the current multivariate analyses and prepare a publishable paper. In addition, the Washington transcript data, like that from Florida, is sufficient to allow us to employ an event history model to assess the discrete-time risks of educational outcomes of various populations of older students. Since these older first-time postsecondary students with deficient educational backgrounds exhibit high rates of non-completion, a discrete-time hazard model is particularly applicable to investigate the factors (in particular, the enrollment pathways) that increase the likelihood of the different older student populations (ESL, ABE, GED, and HS) to complete a program or credential or to reach an educational milestone that significantly impacts their employment prospects. Because these older students have high rates of discontinuous enrollment and highly variegated term-to-term enrollment variables this type of discrete-time analysis would be highly informative.

CCRC has reached an agreement with the Washington State Board for Community and Technical Colleges to obtain additional data in September 2006. We will receive cohorts of all first-time students at a Washington community or technical college (CTC) in three separate academic years (2001-02, 2003-04, and 2005-06). In addition to the student demographic, transcript, and employment data that we have on the current dataset, we will also have information on student transfer outside the Washington CTC system. With this dataset we will investigate student milestone events, such as completion of developmental education or completion of one year of FTE credits, for different student cohorts - similar to our analysis of different milestones for the older student cohorts here. As many community colleges students have non-credential outcome goals and follow discontinuous pathways in their postsecondary enrollment, alternative milestones must be used to measure success, as we demonstrated in this study. Different sub-populations of students, defined by their educational and demographic characteristics and their educational objectives, have different meaningful intermediate educational milestones to which to strive. Tracking student persistence to achieve these milestone events is an important tool for measuring student and institutional success. Once meaningful milestones are identified we will use those as explanatory variables in predicting educational and labor market success.

An additional set of studies using this new Washington dataset relies on the student address to link each student to a U.S. Census block group. The Census data includes many demographic and economic variables that produce a representative portrait of the block group. Similar block groups can be clustered together to produce a profile of like communities across the state. We use a subset of the Census economic variables to calculate a SES (socioeconomic status) variable that represents all students in that block group. With the address information we can also assign student information to a GIS (geographic information system) for mapping and overlaying with other census, geographic, and institutional information. Collectively, these data represent a powerful research tool for many applications. We use the block group SES of the student as an explanatory variable in multivariate analyses. The GIS data can be utilized by individual institutions for learning about their community and student populations and for marketing purposes. The community clusters, SES variable, and GIS overlays are tools that researchers, state higher education systems, and institutions can use to help them better understand their student populations, demographic changes over time, and key characteristics impacting student outcomes. This has been developed with the use of a different Washington dataset than that used in this older student analysis, but the new dataset that we will receive from Washington will have elements of both datasets, which will allow us to incorporate the multiple tools into our future analyses.

The work begun in this project on older students in Florida and Washington has allowed us to develop a sophisticated understanding of state-level datasets and the tools of longitudinal discrete-time analysis. We will continue to utilize this knowledge in our future work with the additional data from Florida and Washington and plan to continue in a similar vein with datasets from other state systems. We were able to study a particular student population (older students) at community colleges and identify finer distinctions among the vast array of students who attend these institutions. We expect that this work will help colleges and state systems consider different ways of making distinctions between student populations and can guide policy to improve the success of those identified populations.

Publications and Presentations

Under review:

Crosta, P., Calcagno, J.C., Bailey, T., & Jenkins, D. "Does Age of Entrance affect Community College Completion Probabilities? Evidence from a Discrete-Time Hazard Model." Under review by *Journal of Human Resources* (submitted May 2006).

Crosta, P., Calcagno, J.C., Jenkins, D., &Bailey, T. "Balancing Work, Family and School: Enrollment Pathways and Outcomes of Older Community College Students Compared to Traditional Age Students." To be submitted to *Research in Higher Education*.

Presentations:

Crosta, P., Calcagno, J.C., Jenkins, D., Leinbach, T. "Balancing Work, Family and School: Enrollment Patterns and Outcomes of Older Community College Students Compared to Traditional Age Students." Presented at the Association for the Study of Higher Education (ASHE) 2005 Annual Meeting, November 17, 2005, Philadelphia, PA.

Crosta, P., Jenkins, D., Leinbach, T. Prince, D., Windham, P. "Using State Student Unit Record Data to Map Pathways to Success for Nontraditional Community College Students." Panel at the Association for Institutional Research 2006 Forum, May 16, 2006, Chicago, IL.

Demographic Characteristics of Project Team

Team Member	Gender	Ethnicity-Race	U.S. Citizenship	Disability Status
1	male	Euro-white	yes	none
2	male	Euro-white	yes	none
3	male	Latino-white	no	none
4	male	Euro-white	yes	none
5	female	Euro-white	yes	none
6	male	Euro-white	yes	none

Financial Accounting of Expenditures

AIR Grant # 05-207
NSF Grant #SRS-0086139
TC # 546704

REPORT OF EXPENDITURES

Grantor: Association for Institutional Research
Project Title: Using State Students Records Data to Map Pathways to Success for Underserved Community College Students
Reporting Period: June 1, 2005 - May 31, 2006

Grant Award		$29,996
PROJECT EXPENDITURES:		
Salaries	13,180	
Fringe Benefits	4,877	
Subcontract	10,540	
Travel	1,399	
Total Expenditures		29,996
Unexpended Balance		$0

Teachers College Columbia University

By: Maria R. Gervacio
Senior Grants Accountant
Grants and Contracts Accounting

Date