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The Characteristics and Experiences of Students Who Transfer to Four-year Institutions

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ABOUT THE ERDC

The research presented here utilizes data from the Education Research and Data Center (ERDC), located within the Washington Office of Financial Management (OFM). ERDC works with partner agencies to conduct powerful analyses of learning that can help inform the decision-making of Washington legislators, parents, and education providers. ERDC's data system is a statewide longitudinal data system that includes de-identified data about people's preschool, educational, and workforce experiences.

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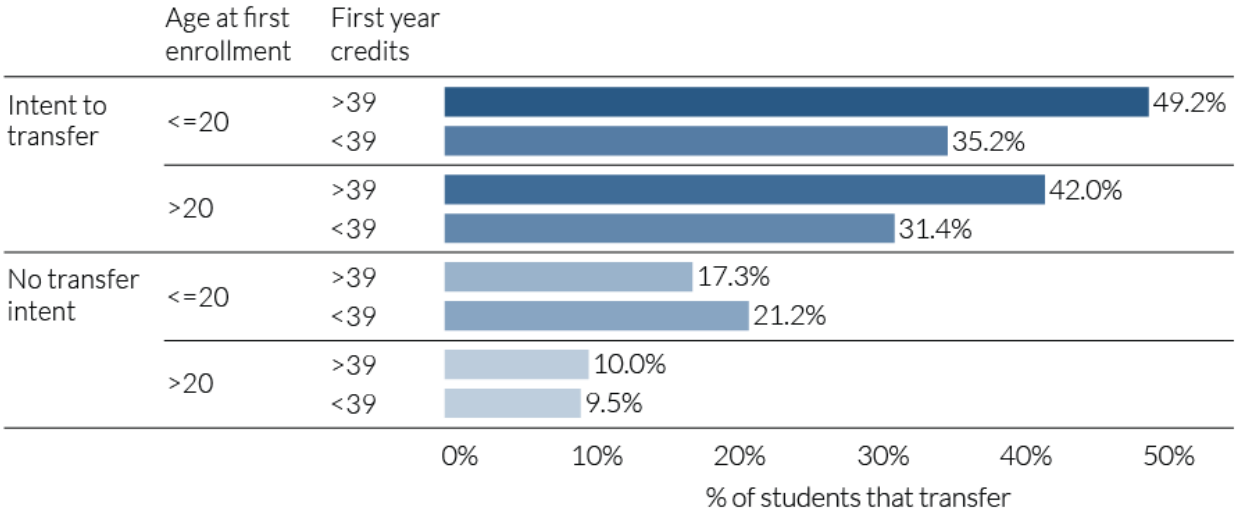
Executive Summary

This report explores the characteristics of students who enrolled in community or technical colleges (CTCs) and subsequently transferred to four-year institutions. Students enrolled in any of Washington's 34 community and technical colleges were included in the cohort if they were a regular resident student in the fall of 2006, had not earned a bachelor's degree before their first enrollment in a community or technical college, among other criteria.

The study concluded that those who registered their intent to transfer to a four-year institution, were younger when they first enrolled, earned more credits during their first year, and had higher GPAs were more likely to transfer to a 4-year institution than those who were older, earned fewer credits their first year, or who had lower GPAs. The analysis showed that CTC students were most likely to transfer if they had declared an intent to transfer, were younger than 20 when they first enrolled, and earned at least 39 credits during their first year.

It is notable that male students were generally more likely to transfer than female students. Further, at younger ages, students who did not take any developmental courses were more likely to transfer than those who did. At older ages, those who took and passed a developmental math course were more likely to transfer than those who did not take a development math course. Further analysis in the full report highlights other risk factors, and potential interaction effects between study variables.



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Introduction

During the academic year 2014-15, more than 17 million students enrolled in public institutions of higher education nationwide, and nearly 40 percent (6.7 million) of them enrolled in community and technical colleges. This number is expected to increase by 21 percent to 8.2 million students by 2025 (Kena et al., 2016).

Many students enroll at a 2-year institution as the first step towards earning a bachelor's degree from a university. Some state this as their intent for enrolling right from the start. Others will enroll for different reasons, but then later adopt an intent to pursue a 4-year degree. Still others will never express an intent to earn a bachelor's degree, but will take steps to do so anyway. Regardless, the transfer function of a 2-year college allows students to transfer a block of credits earned at one institution to be applied towards a baccalaureate degree at another institution.

The success of the transfer function is a joint responsibility within a partnership between the 2-year institutions that prepare the students and the 4-year institutions that receive them. Well-defined, comprehensive articulation agreements and other policies are needed to help make the transfer function work for students. In order to expand on more than 40 years of collaboration at both the state and institution levels to streamline the transfer process, a deeper understanding of the factors that influence students' successful transfer to a 4-year institution is needed. This study explores factors that differentiate students who successfully transfer from those who do not, guided by this central question:

- What specific characteristics of students, their experiences at entry to, and during their enrollment at, a community or 2-year technical college (particularly in the first year) are associated with later enrollment at a 4-year institution and subsequent completion of a baccalaureate degree?

The primary outcome of interest in this report is transfer status: did the student transfer or not?

Background

At the turn of the 20th century, academic institutions struggled to meet the competing demands of a growing number of high school graduates who wanted the upward mobility afforded by higher education, and of administrators at universities who sought to restrict admission to only the most talented and capable students (Handel, 2013). Today's community colleges evolved as a response to this tug-of-war. The terminal associate's degree was formulated to meet the needs of students who, after two years of study at a "junior" college, either still could not meet admissions requirements at a 4-year institution, or wanted to enter the workforce and not pursue additional education.

Thus, public two-year institutions have from the beginning offered both terminal credentials *and* the transfer function. The familiar menu of offerings found at a modern public 2-year institution, encompassing terminal, semi-terminal, public service, and recreational

programs, was first promoted after World War II by a commission convened under President Truman to evaluate the state and direction of education in America (Handel, 2013). The recommendations of this commission encouraged the proliferation of vocational programs, and years later, the Vocational Act of 1963 added financial incentive for schools to develop vocational and technical training programs, which sharply increased the number, variety, and accessibility of short-term skills training (Cohen & Brawer, 2008).

This expansion of the role of community and technical colleges highlighted the economic benefits of quick skills training, and the transfer function was soon locked in competition with vocational programming for attention and resources; transfer was no longer emphasized as the central purpose of these institutions (Levin, 2000). Accordingly, transfer rates declined, dropping from 29% in the early 1970's to just 20% by 1980 (Dougherty, 1994). Vocational programming continued to attract increasing numbers of students until the mid-1990's when the rate of growth in these enrollments began to slow, and the rate of students transferring to 4-year institutions once again began to rise (Cohen & Brawer, 2008). Today, the national transfer rate hovers consistently around 25-28% of those students who state an intent to transfer upon initial enrollment at a 2-year institution (Jenkins & Fink, 2015; Kena, 2016).

Value of a bachelor's degree

In an analysis of the recent "Great Recession," which by official accounts began in December of 2007 and lasted until June of 2009 (The National Bureau of Economic Research, 2010), researchers at Georgetown University demonstrated that workers who had completed a four-year degree were largely protected from the negative impacts of job loss during the recession, while those with some college, or those with only a high school diploma, suffered massive job losses over the course of the 18-month recession (Carnevale, Jayasundera, & Cheah, 2012).

Data are presented illustrating that, by January of 2010, those with only a high school diploma had lost a staggering 5.6 million jobs, and those with some college or an Associate's degree lost 1.75 million jobs. Conversely, those with a Bachelor's degree or higher actually gained 187,000 jobs in the recession, and continued to gain jobs at a faster rate than workers with some college or an Associate's degree throughout the recovery period. For those with only a high school diploma, the job loss trend only slowed, with an additional 230,000 jobs lost by February of 2012.

These researchers also demonstrate that the education level of the national workforce has been steadily increasing over a number of decades, with the demand for workers with some college or an Associate's degree increasing by approximately one percent per year since the mid 1990's, and by two percent over the past few years. In contrast, the demand for workers holding a bachelor's degree or higher has increased by approximately 2-3 percent per year during the same timeframe.

Conversely, jobs for those workers with nothing more than a high school diploma have been steadily shrinking, and are much more sensitive to economic fluctuations in sectors such as the housing market, manufacturing, utilities, and the construction industry. Even within

these sectors, those with higher levels of education have been favored. The report provides an example of how, in the construction industry, those with a bachelor's degree or higher lost only four percent of the available jobs, while those with only a high school education lost 24 percent (Carnevale, Jayasundera, & Cheah, 2012). Similar circumstances in other industries are also described.

Moreover, the data examined by these researchers suggests those with some college or an Associate's degree earn average annual wages 20 percent above those with only a high school diploma; those with a bachelor's degree or better earn nearly twice as much (Carnevale, Jayasundera, & Cheah, 2012). In a prior report, Carnevale and his colleagues show that the lifetime earnings of a worker with a bachelor's degree are 84 percent greater than those of a worker with only a high school diploma, an increase of 14% over the past two decades (Carnevale, Rose & Cheah, 2011).

Accountability and transfer

For decades, colleges and universities have been asked to give an account of their performance by a variety of groups and entities, including regulatory bodies, government agencies, state and federal legislatures, the institutions' own customers, and the general public. In support of this demand for information, extensive research has explored factors that contribute to student persistence, retention, and completion. Most research in these areas defines persistence by timeframe (e.g., from one enrollment period to the next) or by season (e.g., from fall to spring, or from fall to fall). More recently, however, as the emphasis on accountability has increased, these traditional measures have been examined in new ways and for disaggregated populations. In the present study, the behavior of persistence has been conceptualized from the perspective of the transfer function, in that the ability to transfer implies a baseline level of general persistence. In other words, a student must persist along a particular path in order to maximize their potential for successful transfer to a 4-year institution.

Nationally, concern over historically low transfer-rates has engendered a myriad of questions about the performance and characteristics of students who do and do not transfer, seeking to explain why so few students actually transfer when so many start off with in intent to do so (Berkner, He, & Cataldi, 2002; Dowd, Cheslock, & Melguizo, 2008; Melguizo & Dowd, 2009). Expectations for accountability have come to include more detailed questions about the transfer process, including who transfers, where they come from, and what their lives are like. Providing information in response to these questions not only satisfies the demand for accountability, but also highlights the factors that appear related to increases and decreases in transfer numbers. This is a next step in understanding for whom the transfer function is working, and provides direction as to where to look deeper for an understanding of why.

Research questions

This report is the first in a planned series that investigates factors related to transfer behavior and baccalaureate completion outcomes for community and technical college students

in the state of Washington using data extracted from a large-scale statewide database. The outcome variable emphasized in this study is whether the student enrolled at a public 4-year institution. The outcome of baccalaureate completion is presented within the descriptive analysis, but will be explored in greater depth in a subsequent report. In addition to the central research question, two specific lines of inquiry of particular interest also are considered:

1. For students who express an initial intent to transfer, what are the early warning signs of transfer failure?
2. For transfer students who state an initial intent other than transfer, what factors are associated with the subsequent change in transfer outcome from the initial intent?

Through investigation of these specific lines of inquiry, the current study complements previous research on transfer and baccalaureate attainment. By more narrowly defining the way persistence is conceptualized and investigating differences between students that may be operating at a more subtle level than other research has aimed to examine, this study adds to a fuller understanding of the influences that promote or hinder transfer behavior.

Literature review

Overview of degree production and the role of transfer status in the State of Washington

State-level agencies within Washington have examined various aspects of the transfer process over the past fifteen years, seeking to understand not only the demographic features of who transfers to where and why, but also what students need to successfully make the transition, and ultimately graduate with a degree. Policy implications and action plans have been documented and monitored for effectiveness, and modifications proposed and examined in light of the evolving educational needs of students and economic needs of the state. The next section uses a selection of these studies to provide a broad view of the transfer process and its relationship to degree production in the state.[1]

A synthesis of findings from descriptive analyses conducted in three Washington specific studies provides a longitudinal overview of student and institutional performance and transfer behavior in the state of Washington (Washington State Board for Community and Technical Colleges, 2003; Stern, Pittman, & Pavelcheck, 2009; Washington State Board for Community and Technical Colleges, 2013). The on-going series comprising these studies examines a cohort of students every five years who graduate from Washington's 4-year public institutions, and aims to understand what role transfer from the community and technical college system plays in the attainment of baccalaureate degrees. For each of these three studies, a cohort of graduates earning their first bachelor's degree from any of the six

1. Other related studies are available here: https://www.sbctc.edu/colleges-staff/research/reports/default.aspx

public 4-year institutions in the state were tracked. The comparison and synthesis of results across all three studies highlights consistent trends over time. The cohorts examined were drawn from the graduating classes of 2001, 2006, and 2011.[2] Highlights from this synthesis are included here; for the full descriptive synthesis of findings, see Appendix A.

First time bachelor's degree awards show an increasing trend, with an overall increase of 27 percent between 2001 and 2011; however, the rate of increase across the entire five-year timespan slowed, with a 15 percent increase between 2001 and 2006, and a smaller increase of 11 percent between 2006 and 2011. Slightly more females than males comprise each graduating class, with the average age of graduates just under 25, which has decreased slightly over time. Degree awards in the social sciences, health related disciplines, and STEM fields have increased over time.

Not quite half of all baccalaureate graduates in the combined samples took developmental math, and less than seven percent took developmental English. Female students and older students (over age 25) took developmental math more often than males and younger students, and male students took developmental English more often than female students. Proportionately more Asian students than any other racial group took developmental English, while more African American and Hispanic students took developmental math.

Transfer students comprise over half of all baccalaureate graduates, and most are transfer students from the Washington community and technical college system. Transfer students tend to be older than direct entry students, and are most often pursuing business, health related, or education majors. Proportionately, more Hispanics and Native Americans than whites and African Americans are transfer students, although the proportions are close; Asian students show the lowest proportion as transfers. More than half the students at the research and regional comprehensive universities are direct entry students, while the majority of students enrolled at branch campuses and centers are transfer students, primarily from the community and technical college system. The gender split for transfer students is nearly even, with a slightly larger proportion of female students having transferred than male students (54 and 51 percent, respectively).

Academic literature

A considerable body of literature documents the exploration of various correlates of student success, including transfer behavior and degree completion. An extensive review of the literature is provided in Appendix A; the next section provides highlights from that review that demonstrate how variables comparable to those used in the present study have been associated with vertical transfer[3] and baccalaureate completion.

2. Not all data in the 2009 and 2013 studies for the 2006 and 2009 cohorts was reported in the 2003 study for the cohort of 2001. Results for the 2001 cohort are included when available.

3. Vertical transfer refers to movement by a student from a 2-year institution to a 4-year institution.

Theoretical grounding & study variables

This study explores the subject of transfer, conceptualized within the theoretical model of student/institution engagement formulated by Nora (2004). In general terms, this model posits that transfer can be predicted by a combination of socio-demographic, pre-college, and environmental factors (sometimes called "pull" factors due to the effect they have of pulling a student away from an educational commitment), degree expectations, academic and social experiences, and institutional factors. This study draws on several of the categories in this model, and makes use of administrative data that is collected from Washington State education partners and stored at Washington's Education Research Data Center.

Three broad categories describe the measures included in this study: student demographic characteristics, enrollment characteristics, and student performance variables. Many studies including similar variables have been conducted over a span of more than 25 years, with fairly consistent conclusions drawn across time. The list of all variables used in the current study is given in Table 1; definitions and technical notes are found in Appendix A.

Table 1. Variables included in the present study.

Demographic variables	Enrollment variables	Performance variables
Age at CTC entry	Intent status	First quarter GPA
Gender	Enrollment intensity (FT / PT)	First year GPA
Race	Number of quarters enrolled – all courses	Cumulative GPA
Economic Disadvantage status	Number of quarters enrolled – Dev Ed	First year credits earned
Family status	Number of Dev Ed courses taken	Total college level credits earned
Work status	First quarter credit load	DWF rate
		Pass / no pass Dev Ed Math
		Pass / no pass Dev Ed English
		CTC transfer status

Researchers have investigated a wide variety of student characteristics of 2-year college enrollees to identify those that facilitate transfer to a 4-year institution. Intent to transfer has been shown repeatedly to be one the strongest predictors of actual transfer (Bailey, Jenkins, & Leinbach, 2005a; Bradburn, Hurst, & Peng, 2001; Dougherty & Kienzl, 2006; Horn, 2009; LaSota & Zumeta, 2015; Mohammadi, 1994; Porchea, Allen, Robbins, & Phelps, 2010). This is particularly true for students of Hispanic background (Bailey, Jenkins, & Leinbach, 2005a).

A sizeable transfer gap has been noted between white students and those of African American or Hispanic background; some researchers have noted transfer rates for whites as much as twice that of non-white students (Bailey, Jenkins, & Leinbach, 2005b; Hawley & Harris, 2005). However, other researchers have not been able to replicate these results when evaluating only the effect of race on outcomes, but noted that when intent was controlled for, the expected gap was revealed for African American students, but not Hispanic students (Dougherty & Kienzl, 2006). Wang (2012) found that full-time enrollment mitigated the effect on transfer outcomes of being Hispanic, equalizing the probability of transfer for Hispanic and white students.

Females are more likely to attend a 2-year institution, while males are more likely to transfer to a 4-year institution and complete a baccalaureate degree (Bailey, Jenkins, & Leibach, 2005b; Dougherty & Kienzl (2006); Eddy, Christie, & Rao, 2006; Mohammadi, 1994; Surrette, 2001), although some researchers have not been able to confirm these patterns (Fikes & Fikes, 2008). Being under age the of 25 at the time of enrollment, and enrolling at a 2-year institution sooner rather than later after high school graduation are both associated with later transfer (Berkner, He, & Cataldi, 2002; Dougherty & Kienzl, 2006; Hagedorn, Cypers, & Lester, 2008; Porchea, et al., 2010).

Age at entry has also been evaluated in conjunction with a number of covariates. Dougherty and Kienzl (2006) found that intent, parenting status, college major, and enrollment status (full-time vs. part-time) moderate the effect of age on probability of transfer. While younger students are more likely to transfer than older students, attending part-time, having children, or having an initial intent at enrollment other than transfer decreases the likelihood that younger students will transfer to a 4-year institution.

In general, researchers who have studied the effects of enrollment status, parenting status, and number of hours per week spent working have found that when students enroll part-time, have children, or work full-time, the probability of transfer and degree completion is lower (Adelman, 2006; Crosta, 2014; Doyle, 2009; Eagan & Jaeger, 2009; Hoachlander, Sikora, & Horn, 2003; LaSota & Zumeta, 2015; Porchea, et al., 2010; Schmid & Abell, 2003). Higher socio-economic status has also been found to facilitate transfer to a 4-year institution (Bailey, 2004; Bailey, Jenkins, & Leinbach, 2005a, 2005b; Dougherty & Kienzl, 2006; Eddy, Christie, & Rao, 2006; Roksa, 2006; Wang, 2012). In addition, students from higher socio-economic backgrounds more often state an intent to transfer than students from lower socio-economic backgrounds. In contrast, Adelman (2005), did not find any significant effect of socio-economic background on transfer behavior.

Measures of student performance have also been correlated with transfer behavior, including participation in developmental education, GPA, credit load, and course drop / fail rate. With respect to developmental education, the most positive outcomes are seen when students do not have a need for remedial work. Students who are younger and need math remediation are at the highest risk of non-completion, and students who are older and need remediation in mathematics are at a higher risk than other older students who do not need math remediation (Calcagno, Crosta, Bailey, & Jenkins, 2007a). Among students attending full-time, those who had taken developmental courses accumulated fewer credits, were more likely to drop out, and less likely to transfer or complete a credential (Bettinger & Long, 2005). Results for part-time students were similar; however when background characteristics were controlled for, degree completion was not affected, and a small positive effect was noted for credit accumulation and transfer outcomes. Contrasting results obtained in a study using multi-level modeling to account for institutional factors as well as student characteristics suggests that the impact of participation in developmental education may be significantly influenced by the interaction of institutional and student characteristics (Crisp & Delgado, 2013).

Research on the effect of performance in developmental courses suggests that participa-

tion in developmental education courses, when those courses are successfully completed, has no detrimental effect on transfer outcomes (Bahr, 2008; 2010). However, an unsuccessful attempt at developmental coursework in math does have a deleterious effect on the probability of transfer; not enrolling in a developmental math course at all when a need has been noted has an even greater negative effect (Fikes & Fikes, 2008). Fikes and Fikes (2008) did not find the same effect for reading; results obtained by these researcher showed that for developmental reading courses, the strength of these relationships is reversed. It has been suggested by more recent research that it is the time it takes to complete developmental education that is more influential on transfer outcomes than actual participation (Bahr, 2013).

Higher GPAs, credit loads over 12 credits, and dropped, failed, or withdrawn rates less than 20% are all associated with higher probabilities of transfer (Adelman, 2005; Attewell, Heil, & Reisel, 2012; Eagan & Jaeger, 2009; Hawley & Harris, 2005; LaSota & Zumeta, 2015).

Summary of academic literature

In sum, the literature that examines the predictors of transfer and baccalaureate degree completion presents consistent results over time. Students from higher socio-economic backgrounds who do not delay entry to college, who enroll full-time, and take and pass developmental courses as needed have higher probabilities of successfully transferring to a 4-year institution. When students intend on earning a baccalaureate degree, do not drop courses, and earn good grades, they increase their chances of earning a 4-year degree. Some findings contradictory to this profile have been noted; however, these are most likely due to differences in samples, methods, and variable definitions.

The interactive influences of these variables have also been explored to identify their unique and combined effects on student outcomes. Specifically, age, enrollment intensity (full-or part-time), and student intent were identified as predictors of transfer behavior that are mediated or moderated by other variables. Selected combinations are examined with descriptive techniques in the present study to explore how Washington student outcomes compare with results reported here from the academic literature.

Study design

Data sources

The analytic dataset for this study was constructed from data obtained from state education partners, which is housed in ERDC's P20W longitudinal data warehouse. The sample was drawn from the community and technical college data tables, and matched with data from the PCHEES data tables (Public Centralized Higher Education Enrollment System) for those students who transferred from a community or technical college to a public 4-year institution in Washington any time before the end of the 2014-15 academic year. ERDC has a sophisticated methodology for matching data records across systems to create a single set of data for each person represented in any of the participating systems. Data pulled from the warehouse include student characteristics, enrollment information, transcript records, and completion information.

Sample

Students enrolled in any of Washington's 34 community and technical colleges were included in the sample if they were a regular resident student[4] in the fall of 2006, had not earned a bachelor's degree before their first enrollment in a community or technical college, were enrolled during at least one quarter at a community or technical college prior to any subsequent enrollment (if any) at a 4-year institution, and had accumulated 40 or more earned college level credits by the time they were last enrolled in a community or technical college (excluding dual-credit programs).

Consistent with recommendations from previous research, the last criterion allows for this study to focus on students who have a demonstrated potential to transfer credits to a 4-year institution at some point in the future (Bradburn, Hurst, & Peng, 2001; Eagan & Jaegar, 2009; Wassmer, Moore, & Shulock, 2004). Based on these criteria, 84,703 community and technical college students were identified for this study. From this group of students, 22,218 (26 percent) transferred to a public 4-year institution in Washington, and, 15,855 (19 percent) completed a bachelor's degree, as of the end of academic year 2014-15.

Analytic approach

This study adopts a descriptive approach to the data and exploring the relationships between the study variables and the outcomes of transfer and baccalaureate degree completion. Chi-square analysis is used to test for significant differences in rates and proportions between categories on categorical variables. Unless noted in the text, all chi-square analyses were significant at $p < .001$. Examination of the adjusted residuals is used to determine which categories are contributing to the significance when a variable is comprised of more than two categories. Categories where the number of students in the category does not differ from chance (the expected frequency)[5] are noted in the text; these categories do not contribute to the significance of the chi-square test. In addition, a non-parametric decision tree analysis[6] is used to identify those variables that are most useful in distinguishing the pathways and characteristics of students who transfer from those who do not.

4. A regular resident student is defined in this study as a student who is not enrolled as an international student, who is considered an in-state resident for the purposes of tuition assessment, and who is not enrolled in solely community education courses, or any program targeting age-specific groups, e.g., dual enrollment programs for high school students, senior enrichment classes for senior citizens.

5. The proportion expected by chance in each cell for a chi-square table is calculated as $E_{ij} = T_i * T_j / N$, where E_{ij} represents the expected frequency, i represents the treatment condition, j represents the outcome of interest, and N is the total number of subjects in the table. This is the not the sample average, as is commonly mistaken.

6. Specifically, a Classification and Regression Tree (CART) analysis was chosen over other classification procedures (e.g., discriminant analysis), due to the nature of the data and the assumptions of the test. CART analysis is a non-parametric procedure, and is robust against violations of the assumptions necessary for other parametric techniques.

Findings

General sample profile

Demographic and background characteristics

Demographic information for the study sample, as reported for the fall quarter of 2006 (except for age, which is reported as of the time of first enrollment), is presented in Table 2. The sample is predominately white (65 percent), and is comprised of more females (57 percent) than males. The median age is 21, with 64 percent of students under the age of 25. It should be noted that this does not reflect the average student age of approximately 25 years recently reported for the Washington community and technical college system (Washington State Board of Community and Technical Colleges, 2015). Two-year institutions serve a much broader audience with diverse workforce needs in addition to academic needs and, as such, attract a sizeable population of older students in addition to those coming in directly after high school.

Table 3 presents descriptive statistics for family and economic status variables. Status on these variables was assigned based on a prioritization scheme to capture any occurrence of a status of interest, i.e., if a student was ever a single parent, that status is assigned priority over other parenting categories; full-time work status is assigned priority over other categories; any term of PELL eligibility is prioritized for low-SES status.

Over half the sample reported being unemployed, in a job training program while looking for work, being a full-time homemaker, work-study participation, or some other non-traditional work status (52 percent). Forty-eight percent of the sample reported being employed, with 31 percent working half-time, and only 17 percent employed full-time. Most students reported having no children (53 percent), while 29 percent reported parenting children, either with another person in the home (co-parenting, 16 percent), or as a single parent (13 percent). Based on a determination of eligibility to receive a federal PELL grant, more than half the sample is determined to be of low socio-economic means (53 percent).

Table 2. Demographic variables.

Total	84,703	100%
Race		
African American	4,158	5%
Alaska Native	84	< 1%
American Indian	1,159	1%
Asian	6,144	7%
Hispanic	6,204	7%
Multi-racial	2,320	2%
Native Hawaiian	311	< 1%
Not reported	7,594	9%
Other	1,334	2%
Pacific Islander	197	< 1%
White	55,198	65%

Total	84,703	100%
Gender		
Female	48,177	57%
Male	36,442	43%
Age group at first enrollment		
< 20	35,348	42%
20-24	18,735	22%
25-29	10,525	12%
30-39	11,150	13%
40 +	8,945	11%

Table 3. Family and economic background variables.

Total	84,703	100%
Work status		
Full time	14,285	17%
Part time	26,606	31%
Other	43,812	52%
Family status		
No children	44,442	53%
Co-parenting	13,998	16%
Single parent	11,003	13%
Unknown	15,260	18%
Socio-economic status		
Low-income	45,052	53%
Not low-income	39,651	47%

Enrollment status

Descriptive statistics for a variety of enrollment variables are presented in Tables 4 (categorical variables) and Table 6 (continuous variables). Student intent is reported as of fall quarter of 2006. Full-time enrollment status in this study is evaluated based on an average quarterly enrollment of 12 credit hours.

The majority of students in this sample entered community college with a self-reported intent to eventually transfer to a 4-year institution (53 percent). An intent to earn a degree, but not transfer to a 4-year institution was reported by 23 percent of students, while an additional 20 percent reported attending the community college for other educational reasons connected to their workforce or vocational needs. A very small percentage of students reported other intentions for attending (< five percent).

Nearly half the students were enrolled as full-time students (48 percent; defined here as an average quarterly enrollment of at least 12 credits). The average number of credits a student was enrolled in during the first quarter of attendance at the community college is just under 12, or slightly less than what is considered by many to be a full-time load. With a standard deviation of just over five credits, most students were enrolled between six and 17 credits during their first quarter of enrollment. The average number of quarters enrolled was

11, with the majority of students enrolled between six and 16 quarters. The maximum number of quarters enrolled was 45, and potentially reflects students who stay in school to earn multiple certificates and Associate's degrees.

Less than one percent of the sample took more than 30 credits in their first term of enrollment, and this may reflect specific transcripting practices of colleges for certain workforce programs, such as enrolling students for an entire block of courses. These practices are not standardized across the Washington community and technical college system. It is important to note, however, than 82 percent of the sample was enrolled for a course load of one to 15 credits their first term; an additional 15 percent enrolled for 16 to 30 credits. Three percent of the sample was enrolled for less than one credit their first term; this primarily reflects students enrolled in basic education courses that carry little or no credit. Credits enrolled was calculated from transcript records; some courses are not eligible to be added to the transcript, hence some students who were enrolled exclusively in certain basic education courses appear to be enrolled for zero credits their first quarter of enrollment.

Table 4. Categorical enrollment variables.

Total	84,703	100%
Intent		
Transfer	44,800	53%
Degree – no transfer	19,176	23%
Basic skills	1,929	2%
Personal enrichment	367	< 1%
Other workforce	16,526	20%
Unknown	1,905	2%
Enrollment intensity		
Full-time	41,031	48%
Part-time	43,672	52%

Performance: developmental courses

Tables 5 (categorical variables) and Table 6 (continuous variables) present descriptive statistics for aspects of developmental education participation. Consistent with research on national trends, 64 percent of students in this sample were enrolled in at least one developmental education course for math, English, or both sometime during their time at a 2-year institution (Attewell, Lavin, Domina, & Levey, 2006; Bailey, Jeong, & Cho, 2010). Students enrolled in developmental math courses (60 percent) far more often than in developmental English (22 percent); eighteen percent of students were enrolled in both developmental math and English courses. Success rates in both subjects were moderate, with 57 percent of students enrolled in developmental math passing at least one of their developmental courses, and 21 percent of students enrolled in developmental English passing at least one of those courses.

Research has demonstrated that the further below college level a student starts, the less likely the student is to complete a college level course in the developmental subject or to persist with study in other courses, and the greater the risk is of the student eventually dropping out

(Bahr, 2010; Wang, 2013). Institutions in Washington determine their own thresholds for college-level work and the numbering and sequencing of developmental courses, therefore it is not possible to look across the institutions at how many levels below college-level work a student enters at. In order to explore this critical hurdle for students, the number of quarters enrolled in developmental courses and the number of courses taken are used as proxy measures for the amount of time and effort a student needs to expend in completing needed developmental education. For these variables, basic education courses are included in the counts.

The median number of developmental courses students enrolled in is three, and the median number of quarters enrolled in developmental education is also three. This means that while half of the students who enrolled in developmental education were enrolled in three or fewer developmental courses across three quarters, the other half enrolled in four or more courses, in up to as many as 29 courses, across as many as 38 quarters. The majority of students took between one and six developmental courses, across six quarters.

Table 5. Categorical performance variables.

Total	84,703	100%
Developmental Math		
Pass	48,299	57%
No pass	2,653	3%
Did not take Dev Math	30,335	40%
Developmental English		
Pass	17,840	21%
No pass	979	1%
Did not take Dev English		78%

Performance: GPA, credits earned, DWF rate

Table 6 presents the descriptive statistics for the performance variables that are not measured as categories. In their first quarter, students in the sample averaged a GPA of 3.04; this drops slightly by the end of the first year to 2.97. Overall GPA is consistent with first year results, at an average of 3.00, indicating students' performance levels tend to be fairly stable over time. The average amount of credits of the students' total overall enrolled credits that were dropped, withdrawn from, or failed (the DWF rate), is six percent. Only five percent of students in the sample have a DWF rate higher than 24 percent, which is over the threshold of 20 percent presented by Adelman (2005) as the point where a student's probability of transferring is impacted. With a standard deviation of nine percent for this rate, most students are well within an acceptable range for dropped, withdrawn or failed courses based on prior research.

At the end of their first year, students in the sample accumulated on average just under 30 college level credits, with the majority of students earning between 12 and 47 credits their first year. The median credits earned of 29 indicates that half the sample did not attain full-time status for their first year, based on an annual full-time credit load of 36-45 credits. Enrollment intensity is calculated as the average number of credits enrolled per quarter over the course of

a student's entire enrollment history. Since 48 percent of the cohort are considered full-time students given this definition, this suggests that the momentum students exhibit during their first year may be indicative of the level of effort they will sustain over the entire course of their enrollment. Total college level credits earned prior to transfer or leaving the community and technical college system averages just over 100 credits, with most students earning between 56.06 and 146.52 credits (representing one standard deviation from the mean).

Table 6. Continuous variables: enrollment and performance.

	Mean	SD	Median	Min	Max	# included	% included
First qtr credit load	11.43	5.38	12	0	69.3	83,973	99%
First year credits earned	29.71	17.06	29	0	198.1	80,496	95%
Total quarters enrolled	11	5	10	1	45	84,703	100%
Total college level credits earned	101.29	45.23	95	40	686.2	84,703	100%
Number of Dev Ed courses	3	2.3	3	1	29	54,368	64%
Time in Dev Ed (qtrs)	3.45	2.63	3	1	38	61,393	73%
First qtr GPA	3.04	.91	3.29	0	4	71,619	85%
First year GPA	2.97	.83	3.12	0	4	77,300	91%
Cumulative GPA	3	.62	3.08	0	4	83,604	99%
Drop/withdrawal/failure rate	6%	9%	3%	0	83%	84,703	100%

Completion and transfer rates

Transfer and completion rates for each category within the demographic variables, and the breakdown by category within the groups of students who transferred and completed are presented in Table 7.

Table 7. Transfer and completion rates – total sample and within groups.

	N	Transferred	Transfer Rate	Completed	Completion rate
Race					
African American	4,158	901	22%	600	14%
Alaska Native	84	15	18%	11	13%
American Indian	1,159	258	22%	140	12%
Asian	6,144	2,045	33%	1,542	25%
Hispanic	6,204	1,575	25%	1,098	18%
Multi-racial	2,320	717	31%	503	22%
Native Hawaiian	311	70	23%	53	17%
Not Reported	7,594	1,900	25%	1,315	17%
Other	1,334	413	31%	312	23%
Pacific Islander	197	54	27%	39	20%
White	55,198	14,270	26%	10,242	19%
Gender					
Female	48,177	11728	24%	8431	18%
Male	36,442	10465	29%	7405	20%
Unknown	84				

	N	Transferred	Transfer Rate	Completed	Completion rate
Age group at first enrollment					
< 20	35,348	12,359	35%	9,007	26%
20-24	18,735	4,936	26%	3,462	19%
25-29	10,525	2,173	21%	1,521	15%
30-39	11,150	1,726	16%	1,171	11%
40 +	8,945	1,024	12%	694	9%
Work status					
Full time	14,285	3,254	23%	2,322	16%
Part time	26,606	8,353	31%	6,137	23%
Other	43,812	10,611	24%	7,396	17%
Family status					
No children	44,442	13,524	31%	9,736	22%
Co-parenting	13,998	2,647	19%	1,816	13%
Single parent	11,003	1,823	12%	1,146	11%
Unknown	15,260	4,224	28%	3,154	21%
Socio-economic Status					
Low-income	45,052	10,554	23%	7,087	16%
Not low-income	39,651	11,664	29%	8,768	22%
Enrollment intensity					
Full-time	41,031	12,054	29%	8922	22%
Part-time	43,672	10,164	23%	6933	16%
Intent					
Transfer	44,800	17,046	38%	12,398	28%
Degree – no transfer	19,176	2,473	13%	1,663	9%
Basic skills	1,929	270	14%	182	9%
Personal enrichment	367	64	17%	43	12%
Other workforce	16,526	1,803	11%	1,201	7%
Unknown	1,905	562	30%	368	19%
Developmental Math					
Pass	48,299	13,793	29%	9,770	20%
No pass	2,653	450	17%	284	11%
Did not take Dev Math	30,335	7975	24%	5801	17%
Developmental English					
Pass	17,840	4,072	23%	2,775	16%
No pass	979	172	18%	112	11%
Did not take Dev Eng	65,884	17,974	27%	12,968	20%

Race

The variation in transfer rates by race category is fairly narrow, with the lowest transfer rate at 18 percent for Alaska Native students, and the highest transfer rate at 33 percent for students of Asian descent. Multi-racial students follow closely behind Asian students at 31 percent, with the next closest category being Pacific Islander, at 27 percent. The transfer rate for white students is in the middle of the distribution at 26 percent, with Hispanic students of any race closely following at 25 percent. Native Hawaiian students at 23 percent, and American Indian and African American students, each at 22 percent, round out the group. These rates are consistent with previous research that identified a gap between white and African American students (Bailey, Jenkins, & Leinback, 2005b; Hawley & Harris,

2005; Wang, 2012). Chi-square analyses suggest that the rates for Asians and those who are multi-racial are higher than would be expected by chance, while the rates for African Americans and American Indians are lower.

Results for completion rates are similar. American Indian students complete at a rate of 12 percent, followed closely by Alaska Native students at 13 percent. The pattern for the rest of the rates are the same as for transfer, with the highest completion rate at 25 percent for Asian students. Chi-square analyses suggest that significant differences lie between Asians and multi-racial students on the high end, and African Americans and American Indians on the low end, much the same as for the transfer rates. For completion rates, white students are not shown to have any more or less students completing than what would be expected by chance.

Gender

Consistent with the observations of Surette (2001), there is a higher percentage of females than males enrolled in the current sample, and females represent the larger percentage of students in both the transfer and completion groups; however, a higher percentage of males than females transferred and completed a degree. In other words, males have a higher *rate* of transfer and completion than females: Twenty-nine percent of males in the cohort transferred (compared to 24 percent of females), and 20 percent completed their bachelor's degree (compared to 18 percent of females).

Age at entry

Nearly half the sample falls into the age group of those who were under the age of 20 at the time of initial enrollment. This age group has the highest rate of transfer, followed by those students who were between the ages of 20 and 24 when they first enrolled. Consistent with the findings of multiple prior studies, as age at enrollment increases, the rate of transfer decreases (Berkner, He, & Cataldi, 2002; Dougherty & Kienzl, 2006; Hagedorn, Cypers, & Lester, 2008). The same is true of completion rates.

Over half of students who transferred or completed their bachelor's degree were under the age of 20 when they first enrolled. Twenty-two percent of students who transferred and completed their degree were between 20 and 24 at initial enrollment. Only five percent of students who transferred, and only four percent of students who completed their bachelor's degree, were aged 40 or above.

Chi-square analyses suggest that the differences in transfer rates for all age groups except students age 20 to 24 are significant.

Work status

Students in the sample who worked part-time have transfer rates of 31 percent, which is eight percent higher than students who worked full-time. While this finding is modest in comparison to that of LaSota and Zumeta (2015), it is consistent with this and other

previous research (e.g., Dougherty & Kienzl, 2006; Porchea et al., 2010; Schmid & Abell, 2003). Overall, 38 percent of students in the sample who transferred worked part-time, and 39 percent of students who completed their degree worked part-time.

While students who worked part-time have the highest rates of transfer and completion, students with work arrangements in the "Other" category comprise the majority of students who transferred and completed their bachelor's degrees (at 48 percent and 47 percent respectively). This includes, for example, students seeking employment, homemakers, and students with work study positions. Students in this category have transfer (24 percent) and completion (17 percent) rates similar to students who worked full-time.

Family status

Previous research has found mixed results for the effect of parenting on transfer and completion outcomes. Schmid & Abell (2003) found no impact for parenting status, while Dougherty & Kienzl (2006) found that having no children was predictive of successful transfer to a 4-year institution. Consistent with Dougherty & Kienzl (2006), students in the sample with no children show the highest transfer and completion rates at 31 percent and 22 percent, respectively. Students for whom parenting status is unknown have the next highest rates for both outcomes, at 28 percent and 21 percent. Students who were parenting, either in cooperation with another adult in the household (co-parenting), or as a single parent, lag behind both transfer and completion rates by as much as 19 percentage points. Sixty-one percent of students who transferred, and 62 percent of students who completed their bachelor's degree, were without children. Roughly 20 percent of each group have an unknown family status, and roughly 20 percent are parents.

Socio-economic status

Eligibility for a federal PELL grant is used as a proxy for low-income status. Students in the current sample deemed low-income demonstrate lower transfer and completion rates than students who were not deemed low-income, by six percentage points. Students who were not considered low-income comprised a slim majority of the students who both transferred and completed their bachelor's degree.

Intent

Students in the sample who indicated an initial intent to transfer have transfer and completion rates significantly higher than other students, similar to findings of other researchers (e.g., Bailey, Jenkins, & Leinbach, 2005a, 2005b; Dougherty & Kienzl,, 2006; Porchea et al., 2010). Fifty-three percent of students in the current sample indicated an initial intent to transfer; of these, 38 percent transferred, and 28 percent completed a 4-year degree. Students with an intent to transfer represent over three-quarters of those students who transferred or completed their bachelor's degree. Students with other intentions transferred and completed a 4-year degree at significantly lower rates (between seven and 17 percent). Students with an unknown initial intent transferred at a rate of 30 percent and

completed their degree at a rate of 19 percent, but these students comprise just three percent and two percent of the total number of students who transferred or completed their degree (respectively). Chi-square analyses suggest that all differences in transfer and completion rates differ significantly from chance and contribute to the overall significant chi-square result, with the exception of the completion rate for students in the "Unknown" category of intent.

Enrollment intensity

Researchers have shown that students who enroll full-time are more likely to transfer and complete a 4-year degree (e.g., Eagan & Jaeger, 2009; LaSota & Zumeta, 2015). Results for the current sample are consistent with these findings; full-time students in the sample have a transfer rate of 29 percent (compared to part-time students at 23 percent), and a completion rate of 22 percent (compared to 16 percent for part-time students). Full-time students comprise more than half of the students who transfer and complete their degree; however, full-time students are *less* than half of the entire sample.

Developmental education

Prior research shows that students who take developmental courses are less likely to transfer and complete their degree than students who do not enroll in developmental courses (Bettinger & Long, 2005; Calcagno et al., 2007b). However, students who *successfully* complete developmental courses are *more* likely to transfer and complete their degree (Fike & Fike, 2008). Similar results were observed in this sample, but with differing patterns depending on course subject matter.

When only *enrollment* is considered, those who enrolled in developmental math courses have a *higher* transfer rate (28 percent) and 4-year completion rate (20 percent) than students who did *not* enroll in developmental math (24 percent and 17 percent, respectively). When *success* in the course is considered, more pronounced results emerge. Students who successfully passed a developmental math course have higher transfer and completion rates than students who were not successful, as well as students who did not enroll in developmental math at all; students who did not enroll in developmental math have higher outcome rates than students who did not pass the course. This suggests that students who need remediation in math, and who are *not* successful in their developmental courses, are at highest risk of not transferring or completing a 4-year degree.

The opposite pattern is observed for developmental English courses. Those who enrolled in developmental English courses have *lower* transfer (23 percent) and completion (15 percent) rates than those students who did not enroll in developmental English (27 percent and 20 percent, respectively). Students who are *successful* in developmental English and those who did *not* enroll in developmental English courses have *higher* transfer and completion rates than those students who did not successfully complete developmental English.

In both subjects, students who enroll in a developmental course and are not successful

are at the greatest risk of not transferring or completing a 4-year degree. Results of chi-square analyses indicate that for all relationships tested, the differences between groups are significantly different than what would be expected by chance.

Overall, the majority of students who transferred or completed a 4-year degree enrolled in and successfully passed a developmental math course (62 percent for both groups). Most (over 81 percent) did *not* take developmental English. Students who took either developmental math or developmental English and did not successfully pass the course represent only two percent or less of those who transferred or completed their degree.

Continuous variables

Prior research (presented in the literature review) suggests that students who enroll part-time, enroll for less than 12 credits in their first term, have low first-year or cumulative GPAs, or drop, withdraw from, or fail more than 20 percent of their total credits attempted, are less likely to transfer or complete a 4-year degree. In addition, the more time a student spends taking developmental courses, the less likely they will accumulate college-level credits, and the less likely they will transfer or complete a 4-year degree.

These variables and their impact on transfer or degree completion in the current sample are explored using both correlation and independent samples t-tests. Table 8 presents the correlations of each variable with transfer and degree completion, and Table 9 displays the t-statistic values, mean differences, and standard errors for each non-categorical variable.

Consistent with the prior literature, all correlations are significant and in the expected direction, with one exception: the total college level credits earned was not correlated with 4-year degree completion. That said, even though the correlations are all significant, the effect sizes are so small they are essentially meaningless. This is often the case when the sample size is very large, as it is in this study. When a correlation value is squared, it yields the amount of variance explained in the dependent variable. The largest observed correlation has a coefficient of .12, and therefore the most variance in transfer or degree completion explained by any of the variables independently is less than two percent. Regardless, the correlations do reflect the expected patterns in the data, given previous findings by other researchers.

Table 8. Continuous variable correlations with transfer and completion status.

		Correlation coefficients	
	N	Transferred	Completed
Total quarters enrolled	84,703	-.06**	-.10**
Total college level credits Earned	84,703	.02**	.002
# Dev Ed courses	54,368	.01**	-.01*
Time in Dev Ed (qtrs)	61,393	-.07**	-.08**
First qtr credit load	83,973	.04**	.04**
First qtr GPA	71,619	.03**	.06**
First year credits earned	80,496	.07**	.08**

First year GPA	77,300	.04**	.07**
Drop/withdrawal/failure	84,703	-.06**	-.10**
Cumulative GPA	83,604	.08**	.12**

Note: *p < .05, **p < .01, ***p < .001

The negative correlation[7] between total quarters enrolled and transfer or completion is notable. Since a certain number of quarters enrolled is generally required for transfer or degree completion, the negative correlation suggests that the relationship is not linear; it is likely that the relationship is positive *to a certain point*, and then becomes negative as the number of quarters enrolled surpasses optimal. As further evidence of a non-linear relationship, the correlations for only the first two years of study (8 quarters; results not shown here) revealed a *positive* relationship between total quarters enrolled and both transfer and completion. Future studies could use sensitivity analyses and more sophisticated data modeling techniques to determine with more precision the point at which the number of quarters enrolled begins to work *against* a student's likelihood of successful transfer or degree completion.

There are significant differences between students who transferred or completed a 4-year degree and those who did not on mean levels of all continuous variables (with the exception of total college level credits earned for the 4-year degree completion group). Where the difference between the means (mean difference) is negative, it is interpreted that the mean for that variable is higher for the group that transferred or completed than the mean for the group that did not.

On average, students who transferred to a 4-year institution enrolled for more credits in their first term than students who did not transfer. They also accumulated more college level credits their first year (and overall), had higher GPAs (first term, first year, and cumulatively), took more developmental courses (but spent fewer quarters completing those courses), had a lower DWF rate, and had an overall lower number of total quarters enrolled. The results for the 4-year degree completion group are similar, with the exception that students who completed a 4-year degree, on average, took fewer developmental courses than students who did not complete a 4-year degree. These findings are consistent with prior research.

Table 9. Continuous variable t-test results on transfer and completion status (unequal variances).

		Transfer			Completion		
	N	t	Mean dif	Std. error	t	Mean dif	Std. error
Total quarters enrolled	84,703	19.504***	.68	.04	28.342***	1.23	.04
Total college level credits earned	84,703	-7.702***	-2.45	.32	-.594	-.237	.40
# Dev Ed courses	54,368	-3.057**	-.056	.02	2.393**	.05	.02

7. To interpret the direction of the correlations, it should be noted that both the transfer and degree completion outcomes are coded as binary variables, with a value of 1 representing a positive outcome and a 0 representing a negative outcome, or the absence of the desired outcome. Hence a positive correlation would indicate that as the value of the independent variable increases, the dependent variable moves from a negative or absent outcome to a positive outcome.

		Transfer			Completion		
	N	t	Mean dif	Std. error	t	Mean dif	Std. error
Time in Dev Ed (qtrs)	61,393	20.063***	.43	.02	20.539***	.56	.03
First qtr credit load	83,973	-13.223***	-.52	.04	-11.689***	-.56	.05
First qtr GPA	71,619	-8.342***	-.06	.01	-14.902***	-.13	.01
First year credits earned	80,496	-22.421***	-2.92	.13	-24.052***	-3.77	.16
First year GPA	77,300	-10.444***	-.07	.01	-18.941***	-.14	.08
Drop/withdrawal/failure	84,703	17.578***	.01	.01	27.927***	.02	.001
Cumulative GPA	83,604	-25.394***	-.11	.004	-33.811***	-.18	.01

Note: *p < .05, **p < .01, ***p < .001; a negative mean difference indicates a higher mean for the group with the positive outcome

Interactions of demographic and behavioral variables

Three main variables have been noted in the academic literature as strong predictors of transfer outcomes: student intent, enrollment intensity, and age at entry. Several researchers have noted significant mediating or moderating factors in the relationship between these variables and transfer behavior (Bailey, Jenkins, & Leinbach, 2005a; Bettinger & Long, 2005; Calcagno et al., 2007b; Dougherty & Kienzl, 2006; Eagan & Jaeger, 2009; LaSota & Zumeta, 2015; Wang, 2012). This section presents a series of graphs to illustrate these relationships, organized according to the three main variables noted.

Student intent — by race, SES, and age

Demographic variables of race, socio-economic standing, and age at entry to college have been found to moderate the relationship between student intent and transfer behavior (Dougherty & Kienzl, 2006; Wang, 2012). Figures 1-3 explore and compare these relationships for the current sample.

Race. As shown in Table 7 (pages 18-1916), when intent is *not* controlled for, white students transfer at a rate four percentage points higher than African American students, and one percentage point higher than Hispanic students. Figure 1 illustrates that when transfer rates are disaggregated by race *and* intent, the gaps become wider for those students who express an initial intent to transfer. Among students with an intent to transfer, white students have a transfer rate six percentage points higher than African American students, and three percentage points higher than Hispanic students.

Chi-square analyses conducted for each intent grouping provides evidence only partially consistent with the findings of Dougherty and Kienzl (2006), who noted these same differences but did not find them to be statistically significant. Before controlling for intent in the current sample, the four percentage point gap between white and African American students is a statistically significant difference ($\chi^2 = 271.287$, df = 1, $p < .001$). After controlling for intent, the chi-square statistic for students who intend to transfer is still significant, but not for those who do not intend to transfer. While the current study results do

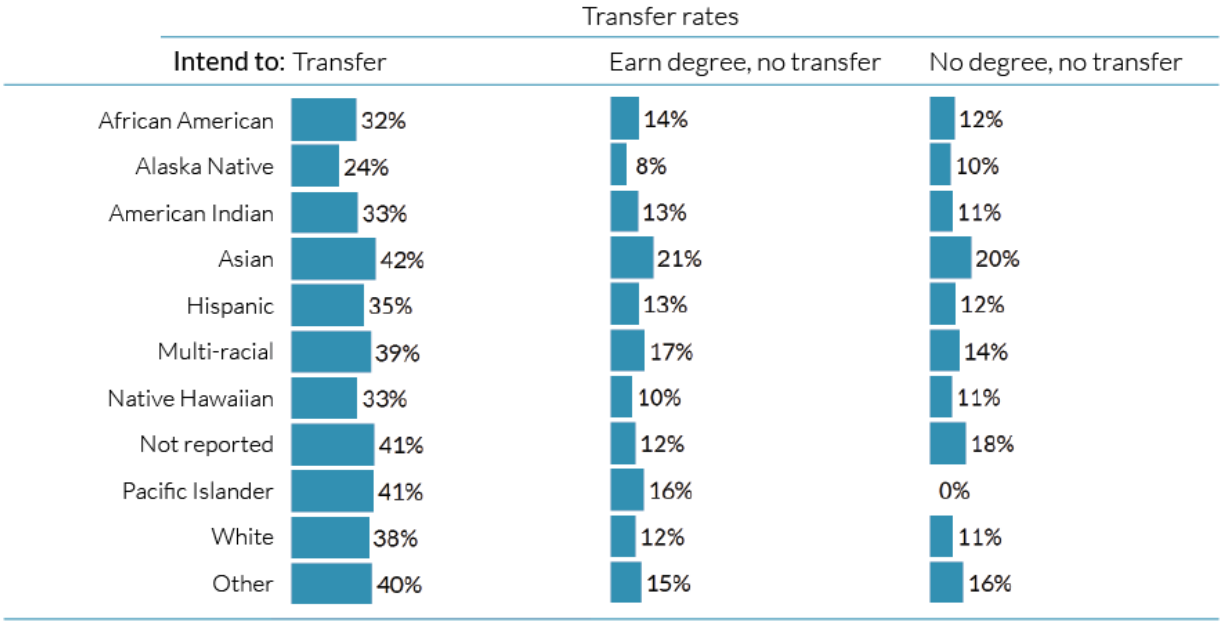

Figure 1. Transfer rates disaggregated by race and intent (see also table B1).

not completely replicate the findings of Dougherty & Kienzl (2006), the chi-square value did drop considerably for students with a transfer intent, from $\chi^2 = 271.287$ to $\chi^2 = 29.11$. In addition, the gaps between students in the groups with initial intents other than transfer did become non-significant.

Socio-economic status. The observations of Bailey, Jenkins, and Leinbach (2005a) regarding the relationship between student socio-economic background and stated intent were only partially confirmed in the current sample. Students from *both* low and high economic backgrounds more often stated an intent to transfer (48 percent and 58 percent, respectively) rather than just those with a higher economic status. However, students from higher economic means are more likely to actually transfer. Figure 2 shows that students who intend to transfer and who are from a higher economic background have a transfer rate six percentage points higher than students who intend to transfer and who are from lower economic backgrounds. Students who did not state an intent to transfer, however, transferred at the same rate, regardless of socio-economic background.

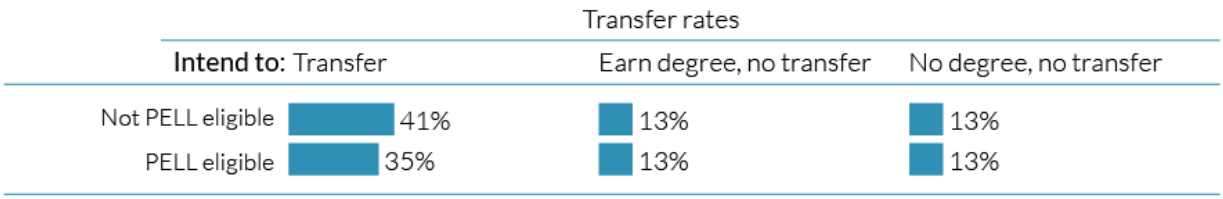

Figure 2. Transfer rates disaggregated by SES status and intent (see also Table B2).

Age. A considerable amount of literature documents the negative effect of age on the probability of transfer (Berkner, He, & Cataldi, 2002; Dougherty & Kienzl, 2006; Hagedorn, Cypers, & Lester, 2008). Figure 3 illustrates a similar pattern for the current sample: the younger students are at first enrollment, the more likely they are to transfer, regardless of initial intent. In addition, transfer rates are higher for those who state an intent than those who do not, regardless of age.

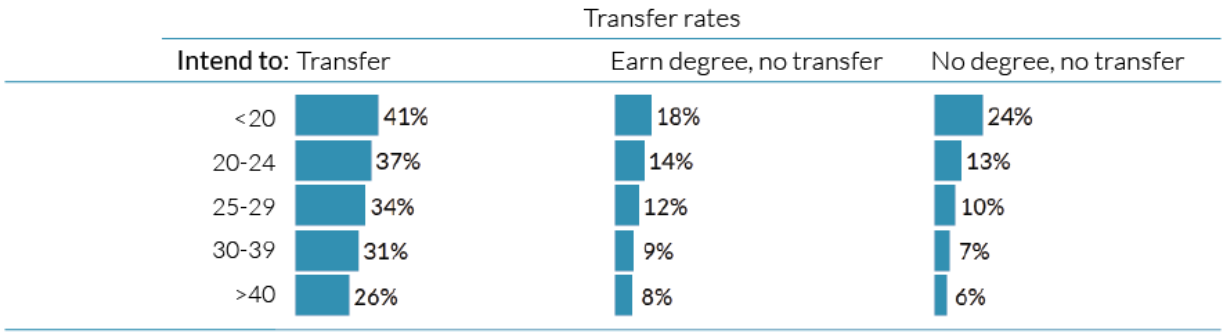

Figure 3. Transfer rates disaggregated by age and intent (see also Table B3).

Enrollment intensity – by race, age, and developmental education performance

Just as race and age have been found to moderate the relationship between student intent and transfer behavior, these variables, in addition to successful completion of developmental courses, have been found to also moderate the relationship between enrollment intensity and transfer behavior. Figures 4 through 6 explore and compare these relationships for the current sample.

Race. Wang (2012) tested the mitigating effect of full-time enrollment on the transfer gap between Hispanic students and white students. In general, Wang noted a statistically significant gap between Hispanic and white students, but when only those students enrolled full-time were compared, the difference in transfer rates was no longer statistically significant. These results were *not* replicated for the current study sample. Table 7 (pages 18-1918) shows the transfer rates for students by race; the one percent gap between Hispanic and white students is not statistically significant. Figure 4 displays transfer rates by race, disaggregated by enrollment intensity. The gap remains at one percentage point for both full- and part-time students. Chi-square analyses for this disaggregation are not significant, suggesting that differences in transfer rates may be more dependent on enrollment status than on race.

However, chi-square analyses conducted on transfer rates for Hispanic students compared to white students when disaggregated by *intent* (c.f., Dougherty & Kienzl, 2006) reveal a significant gap. Increasing from just one percent to three percent in favor of white students when only those students with an initial intent to transfer are considered, this difference is statistically significant ($\chi^2 = 9.356$, df = 1, $p < .01$).

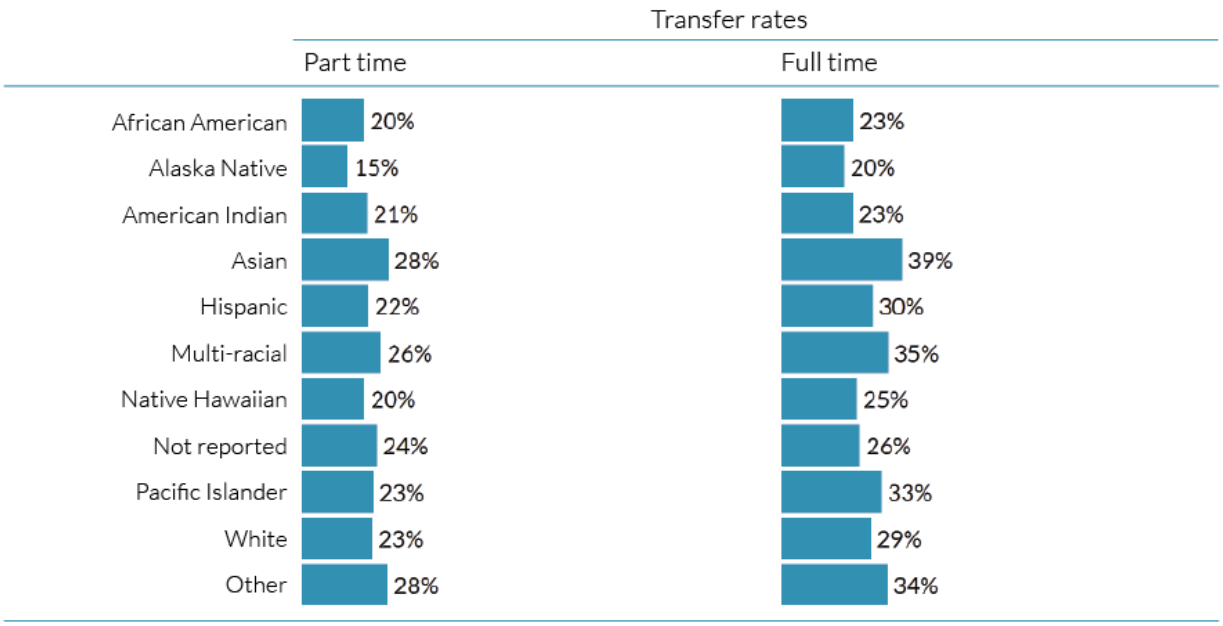

Figure 4. Transfer rates disaggregated by race and enrollment intensity (see also Table B4).

Age. Figure 5 illustrates a pattern in the current sample similar to that noted by Dougherty and Kienzl (2006) for the combined influence of age and enrollment intensity on transfer rates. Students under 20 years of age have the highest rates of transfer, regardless of enrollment intensity; however, full-time students were more likely to transfer for most age groups. The differences, while as small as just one percent in some cases, were statistically significant for each group except the group aged 30-39. Note that the rates for the oldest group (> 40) showed the opposite effect: full-time students were less likely to transfer than part-time students. These results suggest that enrollment intensity may moderate the effect of age on the probability of transfer to a 4-year institution.

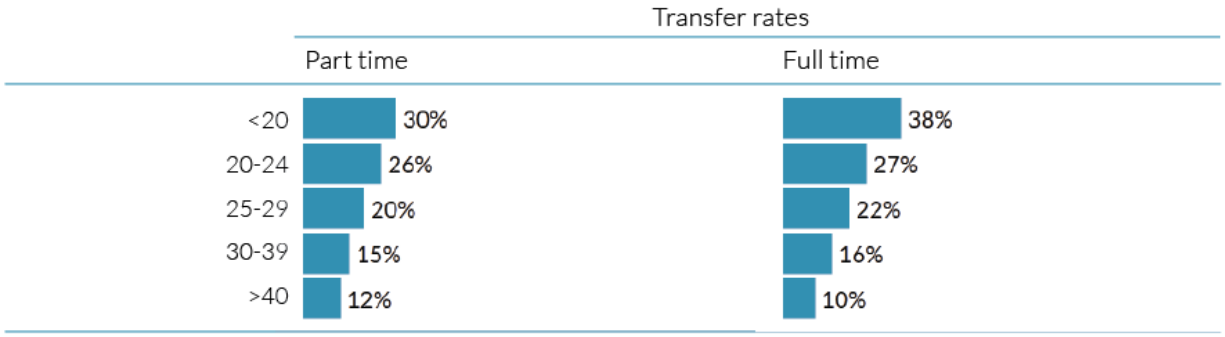

Figure 5. Transfer rates disaggregated by age and enrollment intensity (see also Table B5).

Developmental education performance. Based on the findings of Bahr (2008; 2010), it is reasonable to expect that full-time enrolled students would make more timely progress through developmental courses, and those who are enrolled full-time who are also success-

ful in their developmental courses would have the highest transfer rates. Figure 6 shows the transfer rates for students taking developmental courses in English and Math, disaggregated by enrollment intensity.

Those students who do not take a developmental English course have the highest transfer rates, regardless of enrollment status, compared to students who do take developmental English. The gap between those who did not take a developmental course and those who passed developmental English is larger for part-time students than full-time students by four percentage points. The transfer rates for students who did not take developmental English are significantly higher for full-time students, as are the rates for those students who passed a developmental English course. Students who did not pass a developmental English course had the lowest transfer rates, but full-time students in this group still transferred at a significantly higher rate than part-time students.

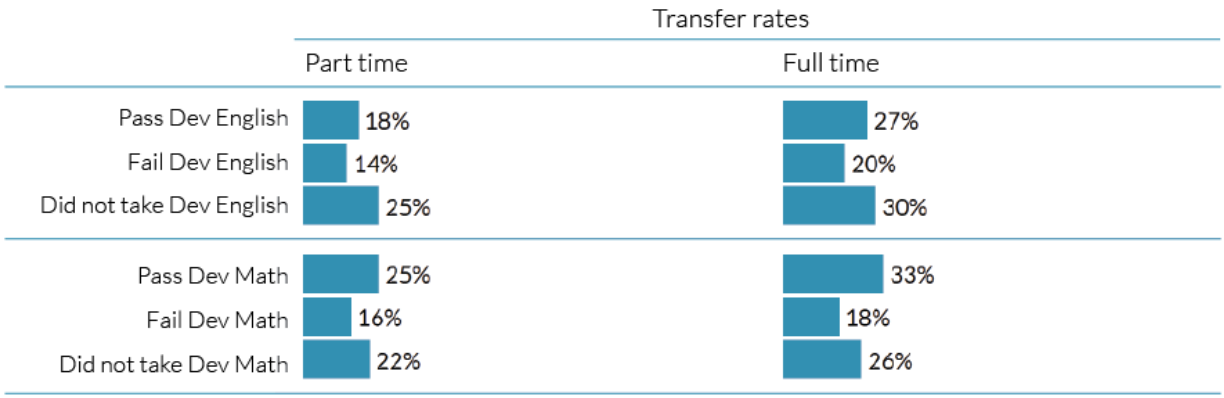

Figure 6. Transfer rates disaggregated by developmental education performance and enrollment intensity (see also Table B6).

In contrast, students who passed a developmental math course are more likely to transfer than those who did not take a developmental math course, whether full- or part-time; the difference in rates between groups is larger for full-time students. Students who took a developmental math course but did *not* pass it have significantly lower transfer rates compared to those who passed a course or did not take one, but within this group, full-time students have higher transfer rates than part-time students. This difference, however, is not significant.

Age – by family status, work status, and developmental education performance

There has been some debate within the research community as to why students entering college at an older age do not transfer or pursue a 4-year degree at the same rate as younger students. The most common explanation is related to the pressures of full-time employment and family life, which can become more demanding as time goes on. Some researchers, however, have found evidence that other factors may shape the differing pathways that older students take through post-secondary education. (Calcagno, et al., 2007a). Figures 7 through 9 present transfer rates for the current sample, disaggregated by age

group and family status, work status, and success in developmental education.

Family status. Results displayed in Figure 7 confirm the findings of Dougherty & Kienzl (2006) for the current sample. In all age groups except the group 40 years of age and older, students with no children have the highest transfer rates compared to students with children.

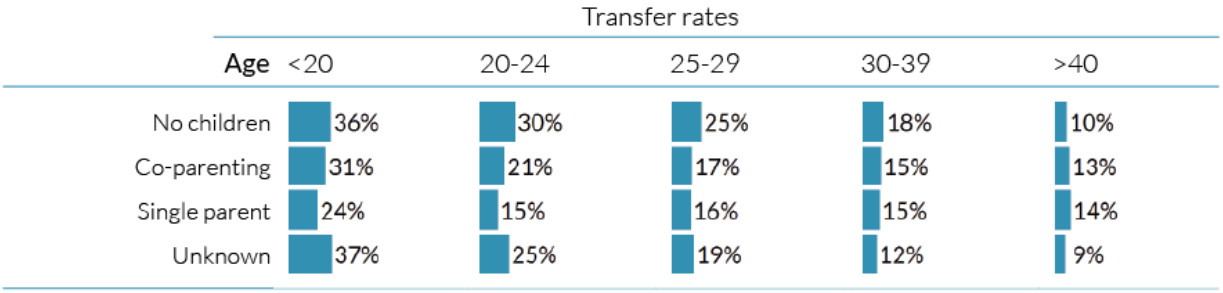

Figure 7. Transfer rates disaggregated by family status and age (see also Table B7).

When comparing transfer rates by family status across age groups, an interesting pattern emerges. Chi-square analyses indicate that all transfer rates differ from expected values except those for students 20-24 who have no children or are single parents, and those who are 24-29 who are single parents. The higher rates for students with no children imply that overall, having no children is the strongest positive family status indicator for subsequent transfer to a 4-year institution; the chi-square analyses suggest that this effect is strongest for students under the age of 40, particularly for those students age 30 to 39. For this group, the difference between having children and not having children in terms of transfer outcomes is clear; regardless of whether a student is co-parenting or a single parent, having children has a significant and negative impact on transfer rates. For all other age groups, results for the co-parenting group provide support for the notion that having another supportive person involved in family matters may have positive impacts beyond the immediate function of sharing parenting responsibilities. Being a single parent is shown to be the least advantageous family status with respect to transfer rates.

Work status. Several teams of researchers have concluded that students who work full-time are less likely to transfer to a 4-year institution (Dougherty & Kienzl, 2006; Porchea et al., 2010; LaSota & Zumeta, 2015; Schmid & Abell, 2003). Dougherty and Kienzl (2006) found a moderating effect of several student characteristic variables on the relationship between age and transfer, but these variables did not include work status. Further, LaSota and Zumeta (2015) controlled for age in their analysis of the impact of work status on transfer behavior. Based on these observations in the literature, the relationship between work status and transfer behavior is disaggregated by age group; Figure 8 illustrates these results.

In all age groups except for 30-39 year olds, students working full-time have lower transfer rates than students with part-time or other types of work arrangements. These results are consistent with previous research; however, it is unclear from these analyses why working full-time would contribute to a higher transfer rate for students between the

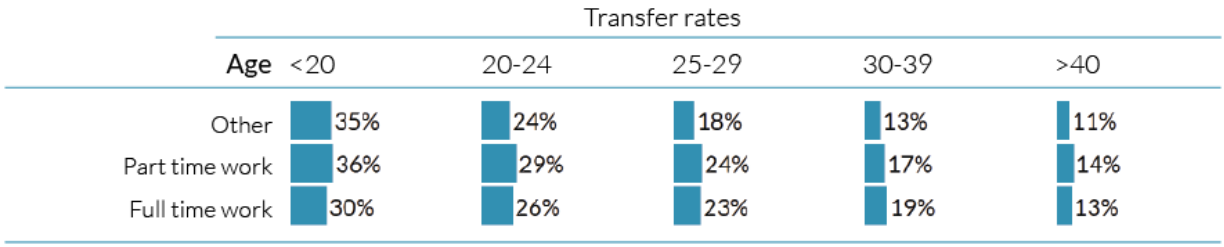

Figure 8. Transfer rates disaggregated by work status and age (see also Table B8).

ages of 30 and 39. This finding could be explored further by adding additional explanatory variables in an analysis using a more sophisticated data modeling technique. Alternatively, it is possible that the result is due to factors not captured by the data presently available.

Developmental education performance. Motivated by the line of inquiry established by Calcagno and his colleagues (2007a; 2007b), performance in developmental education was examined by age group and transfer outcome for the current sample. Figure 9 displays the results for this exploration. When performance in developmental education is disaggregated by age, a clear pattern emerges. Students who are under 20, and therefore most likely to have recently been in some type of formal educational setting, show the highest transfer rates if they did not take any developmental education courses. Those who did take a developmental course in either subject have significantly higher transfer rates when they are successful rather than unsuccessful in their courses.

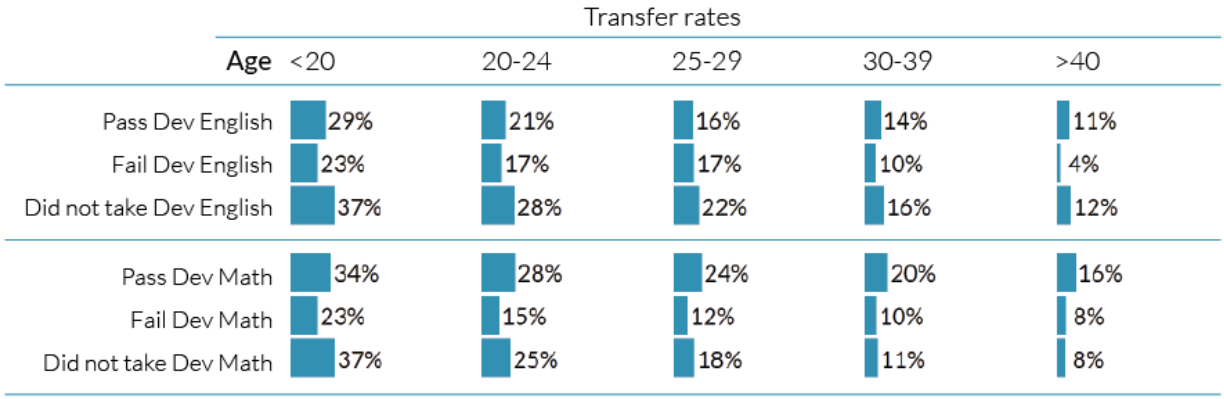

Figure 9. Transfer rates disaggregated by developmental education performance and age (see also Table B9).

This pattern holds true in developmental English for students over 30 years of age. For students in the 25-29 age group, the difference between successful and unsuccessful completion of developmental English is not significant, but those who did not take developmental English still have the highest transfer rates. Results for students in developmental math are somewhat different. Whereas the under 20 age group shows the highest transfer rates for students who did not take developmental math, all other age groups show the highest transfer rates for students who successfully passed a developmental math course. In addition, the rates of transfer for students who did not take a developmental math course and who are successful

in a developmental course decrease with age. The gap in percentage points for the transfer rates between those who enrolled in and passed developmental math and those who did not enroll increases with age, and the rate for those who did not enroll in developmental math drops off faster than the rate of those who enrolled and were successful. These results are consistent with the findings of Calcagno et al., (2007b) and provide supporting evidence for their hypothesis that time out of school, and the need for remediation (particularly in math), is a potential explanation for why older students are less likely to transfer.

Student profiles that signal potential to transfer

A Classification and Regression Tree (CART) analysis was performed to address the specific research questions that aim to explore more deeply the differences between students who transferred and those who did not. CART analysis is a non-parametric form of predictive analytics that is robust against violations of the assumptions of normal distributive properties of the data. That said, let it be clear that the analysis conducted for this study is not intended to test a predictive model. CART analysis can be used to reveal contingent relationships that help determine an outcome of interest, and to produce a profile of variables that, in combination, are most efficient in predicting those outcomes. It is this ability of the technique to identify contingent relationships that is of particular interest in this analysis. Community college administrators and staff who need a way to identify students who may be at risk of not meeting their educational goals so they can provide needed support may find this application of the CART procedure helpful, as common pathways to positive and negative outcomes can be uncovered. Once a student is located on a pathway, the point at which the path begins to diverge substantially between these opposite outcomes can provide insight as to when an intervention may be most effective in shifting a student's trajectory towards a more desirable outcome. This type of information would be most valuable to academic counselors and staff who interact with students to boost their chances of success and could inform efforts to construct a system of early warning for academic failure.

CART analysis uses a recursive algorithm procedure that seeks out the one variable that can split the data into two groups with maximum homogeneity of the data within those groups; the analysis repeats this process, making successive splits until no further splits improve the prediction. The procedure also seeks a balance between model complexity and improvement in homogeneity. In other words, it seeks out the simplest model for the largest improvement in prediction. Given the non-normal distributive properties often found in administrative datasets, this procedure is ideal for the current study. Because CART analysis is sensitive to a variety of subjective decisions made by the researcher (e.g., number of levels the tree is carried out to, the specific variables included, selection of validation procedures, etc.) and is sample-specific, the technique should be applied to a variety of samples and conditions to identify the variables, and thresholds for those variables, that are most common as indicators of a need to intervene to mitigate risk of poor student performance.

Because the resulting regression tree for this study is extensive, it is presented in three

figures. Figures 10 and 11 represent the branches of the tree for those students who expressed an intent to pursue transfer when they first enrolled. Figure 10 presents the right side of the tree from the first major split (first year credit accumulation), and Figure 11 presents the corresponding left side. The tree for the students with an intent other than transfer at initial enrollment is much more compact and is displayed in Figure 12. Pathways are color-grouped for ease of identification; the path that results in the highest transfer probability is identified by green connector lines and the path with the lowest transfer probability is shown by red connector lines. Both pathways occur on the right side of the tree for students with a stated intent to transfer. A full walk-through explanation of the tree segments is provided in Appendix B. An abbreviated version that highlights the major points of departure through the tree pathways is presented in the next section.

Students with a transfer intent

Confirming the assertion of Voorhees & Zhou (2000) that transfer behavior is best understood in the context of student intent, the most powerful distinguishing variable for the current study sample is student intent. Students who stated an initial intent to pursue transfer to a 4-year institution have a 38 percent probability of realizing that goal, compared to a 13 percent probability of transfer for those who stated an intent other than transfer at initial enrollment.

As depicted in Figure 10, among those with an expressed intent to transfer, the next most powerful indicator of transfer is the cumulative GPA at the time of exit from the 2-year institution. Students whose cumulative GPA is at least 2.35 have an increase in probability of transfer; less than 2.35, but no lower than 1.83, results in a drop in transfer probability. A GPA of less than 1.83 signals a very small probability for transfer.

The lower probability of transfer for students who have a low GPA (1.83 =< GPA < 2.35) may be mitigated somewhat if a student is enrolled full-time for at least nine quarters. If attending part-time for nine quarters the mitigation effect is less, especially for students who enrolled in developmental education compared to those who did not. Students whose GPA falls between 2.35 and 2.15 (inclusive) are not as affected by fewer quarters of enrollment as are students below the 2.15 GPA threshold.

For students with a cumulative GPA of at least 2.35, earning a minimum of 39 college level credits in the first year, rather than number of quarters enrolled, has a bigger impact on transfer probability.

For the current sample, college level credits earned in the first year appears to be an important point of departure along the path through college that distinguishes those who transfer and those who do not, as the combination of factors that impact transfer probabilities grows exponentially from this point on.

Total quarters enrolled enters next, with fewer than 12 enrolled quarters increasing transfer probability. Number of enrolled quarters appears to interact with age, GPA, and gender to produce variation in transfer probability. Male students under the age of 20 who

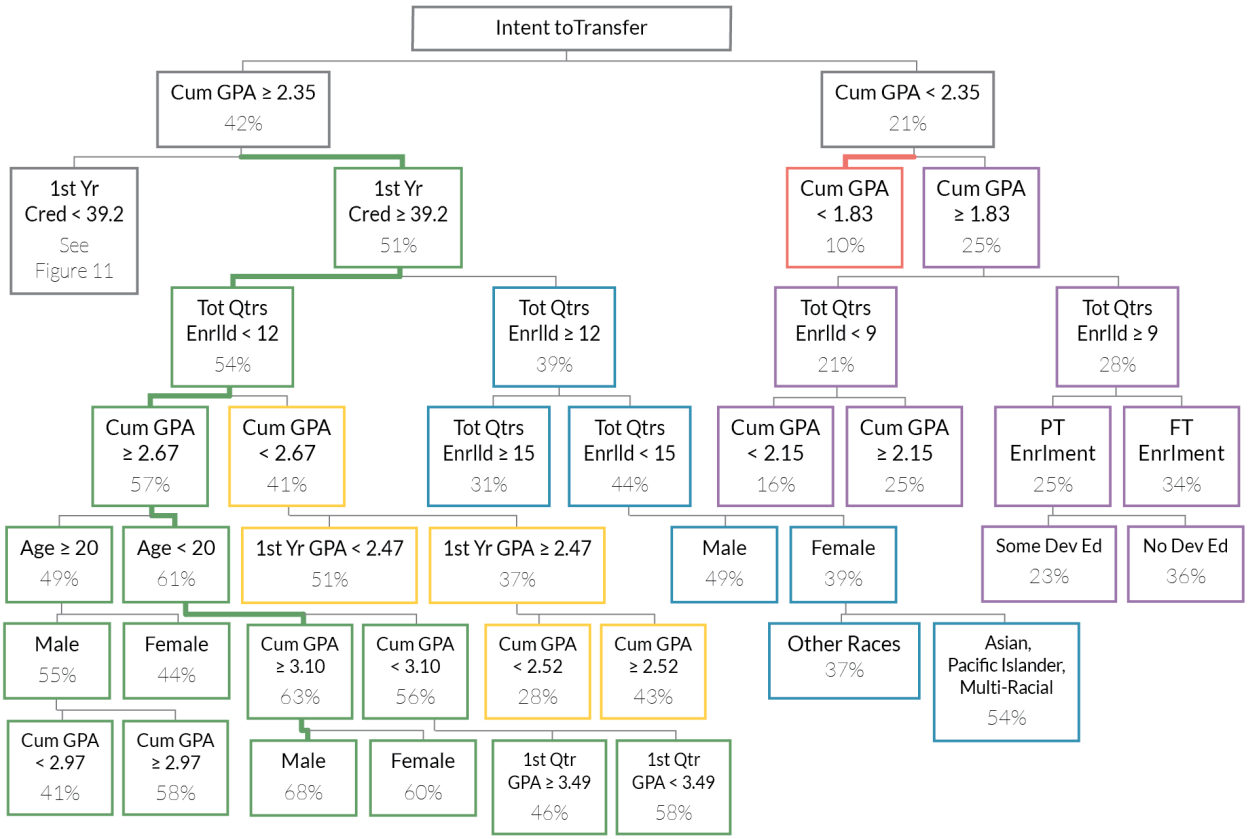

Figure 10. Right-hand side of decision tree showing pathways for students who have earned more than 39 college level credits in the first year.

are high performing (cumulative GPA >= 3.10) and who enrolled for less than 12 quarters have the highest transfer probabilities, followed by male students over the age of 20 who have a cumulative GPA of at least 2.97. Older female students have a lesser transfer potential, regardless of GPA.

Enrolling between 12 and 15 quarters appears to constrain the effect of GPA for males; females continue to show a lesser transfer potential in this range of enrolled quarters, unless they are of Asian, Pacific Islander, or multi-racial background, in which case their probability of transfer is greater than that of males in this group.

Pathways for low credit-earning students are displayed in Figure 11. Students who did *not* meet the 39 college level credit threshold for credits earned in the first year of enrollment and who enrolled for fewer than 15 quarters have a transfer probability 14 percentage points lower than higher credit earners enrolled for fewer than 12 quarters. As was seen in the high credit earning group, gender, age, and GPA appear to interact with number of quarters enrolled for students who accumulate fewer college level credits in their first year, producing variation in transfer probabilities.

Among these students, being male and under the age of 24 with a GPA of at least 2.93 enhances transfer probability. Males over the age of 24 boost their probability of transfer if

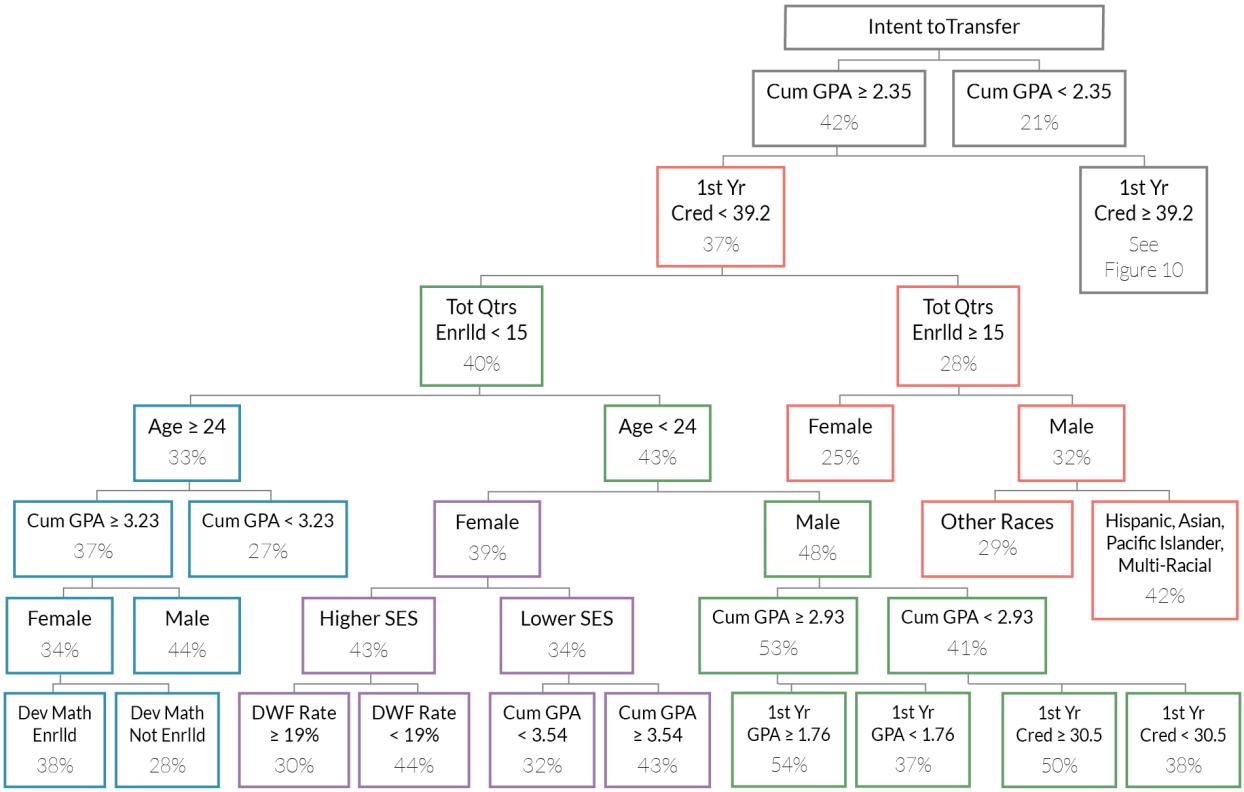

Figure 11. Left-hand side of decision tree showing pathways for students who have earned fewer than 39 college level credits in the first year.

they can maintain a GPA of at least 3.23, but still do not exhibit transfer rates that match those of the younger men. Females over the age of 24 show much lower probabilities, especially if they have not taken a developmental math course. For younger females, coming from a higher socio-economic background and having a low DWF rate become important. Younger females from lower SES backgrounds need to keep their GPA at or above 3.54 to boost their probability of transfer.

Transfer probabilities for low credit-earning students who are enrolled for more than 15 quarters are impacted by gender and race. Male students who are of Hispanic, Asian, Pacific-Islander, or multi-racial backgrounds have better transfer probabilities than male students of other racial backgrounds; female students in this group have lower transfer probabilities than males, regardless of racial background.

Students with an intent other than transfer

Figure 12 shows all the relevant pathways to transfer for students who express an intent at initial enrollment other than transfer. These students have a transfer probability of 13 percent. Among these students, age is the strongest indicator of who will transfer, with students under the age of 20 showing a greater probability of transferring than older students.

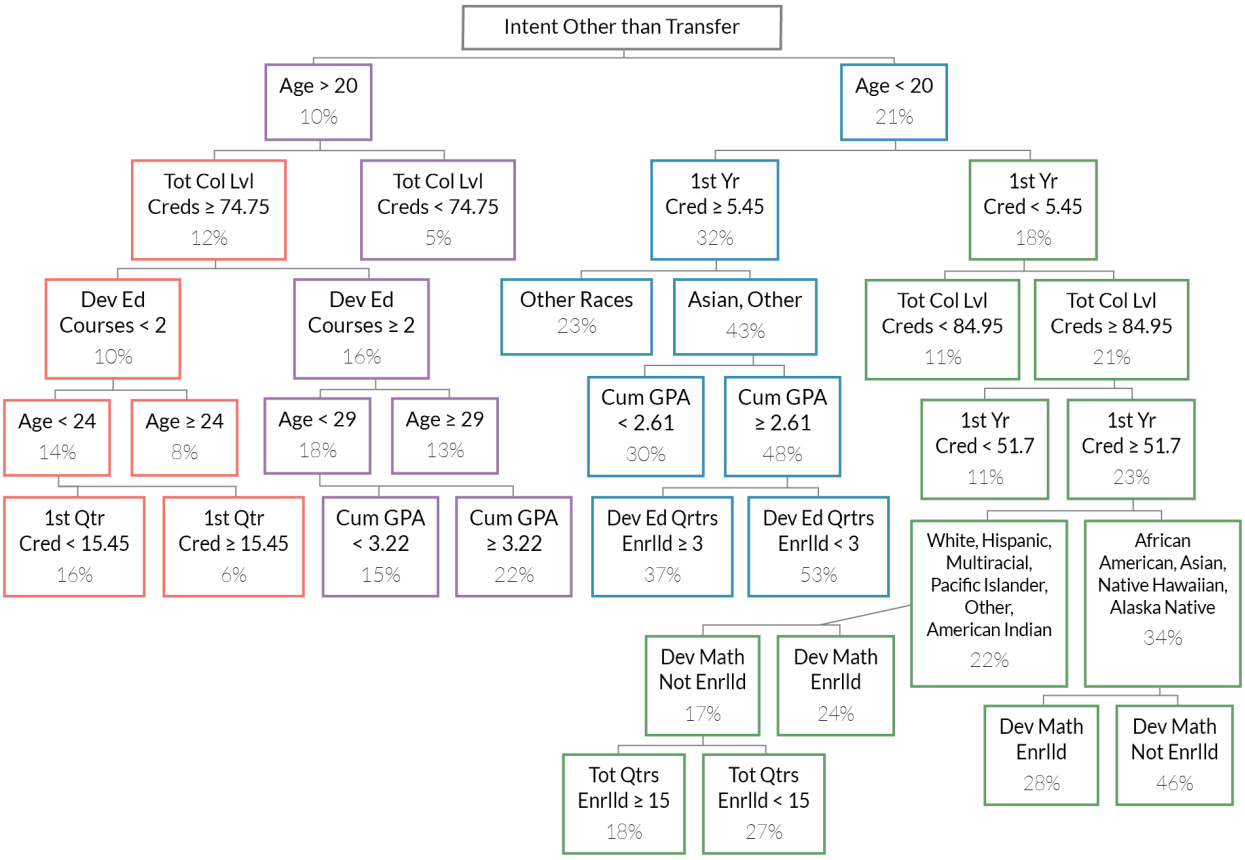

Figure 12. Decision tree showing pathways for students who have an initial intent other than transfer.

As is seen for students with a transfer intent, college level credits earned in the first year is a powerful predictor, but has a much lower threshold for this group. For students under the age of 20, this variable increases the probability of transfer with a threshold of just over five college level credits. This probability is higher for students of Asian background, or students of a racial background categorized as "Other." Better transfer probabilities are further realized by these students if they maintain a cumulative GPA of at least 2.61 and have taken developmental courses for fewer than three quarters.

Transfer probabilities for students earning less than five college credits their first year are impacted by a combination of age, race, total number of credits earned, the timing of earning those credits, developmental education status, and the total number of quarters enrolled. Students under the age of 20 who earn more than 84.95 credits over their entire enrollment history show a higher probability of transfer, especially if 60% of those credits are earned in the first year, and the student identifies as African American, Asian, Native Hawaiian, or Alaskan Native. Additional boosts in transfer probabilities are noted for students of these racial backgrounds if the student has never taken developmental math; for students of other racial backgrounds this effect is present if the student did NOT take developmental math *and* enrolled for more than 15 total quarters, OR has taken and passed a developmental math course *and* the number of quarters enrolled is less than 15.

For students age 20 and above, the probability of transfer is higher when they earn at least 74.75 college level credits. Beyond this factor, whether developmental education hinders or helps a student appears to be dependent on age. For students aged 24 thru 29, taking more than two developmental courses increases transfer probability; for students over the age of 29, the boost in transfer probability is seen only for those students who have a cumulative GPA of at least 3.22. For students between 20 and 24 years of age, the effect is reversed in that enrollment in *fewer* than two developmental courses provides the boost, and is enhanced when the total number of credits enrolled in during the first quarter of enrollment is less than 15.45.

Summary

Based on the results of analyses for the current study sample, cumulative GPA, college level credits earned in the first year, and total number of quarters enrolled are the major factors that distinguish between those who transfer and those who do not for students in this sample with an initial intent to transfer. After accounting for the major impact of these variables, minor impacts of demographic differences (age, race, gender, socio-economic status) and academic behavior variables (DWF rate and developmental education participation) account for some variation in transfer probability for different pathways. Overall, among students who expressed an initial intent to transfer, male students under the age of 20 who earn a minimum of 39 credits their first year of enrollment, earn a cumulative GPA of 3.10, and are enrolled for 12 or fewer quarters total before transferring are the most likely to transfer. In contrast, for this group of students (those who express an initial intent to transfer), students of any gender, age, or race who enroll part-time, earn a cumulative GPA of less than 1.83, and are enrolled for a less than nine total quarters, are least likely to actually transfer.

For students in this sample who expressed an intent other than transfer at initial enrollment, age, credit accumulation for the first year and overall, cumulative GPA, and the number of developmental courses taken are the major factors distinguishing those who ultimately transfer from those who do not. Participation in developmental education improves or hinders the probability of transfer depending on the race of the student. Despite not expressing an initial intent to transfer, students under the age of 20, who are Asian or of a racial background categorized as "Other," who maintain a cumulative GPA of 2.61 or better, and are enrolled in developmental education courses for fewer than three quarters are most likely to transfer.

Conclusion

This study explored whether specific aspects of community college students and their experiences were different between students who transfer and those who do not. A review of the academic literature showed clear, consistent patterns in the data regardless of whether those data were obtained from federal databases, state administrative systems,

or specific colleges: overall, students who express an initial intent to transfer are far more likely to transfer than those students who do not express this intent at initial enrollment, or who remain undecided. Additionally, students who attend full-time, accumulate a critical number of credits in their first year of enrollment, do well in their classes, are from higher socio-economic backgrounds, do not work full-time, or have not been away from formal education for very long are more likely to transfer than students whose experience varies from these parameters. Further, students who are African American or Hispanic, after controlling for intent and other background variables, tend to have transfer rates similar to white students. More females attend college, but males are more likely to transfer. Students who are older benefit from participation in developmental education, while younger students do not experience the same level of benefit.

Analyses explored whether similar patterns could be identified for Washington students, using data from the Washington State community and technical college and university systems. Interaction relationships were examined for the primary variables of student intent, enrollment intensity, and developmental education performance. Consistent with previous research (Dougherty & Kienzl, 2006), a transfer gap between African American and white students was noted in the current sample; however, in contrast with the findings of these researchers, this gap was significant before controlling for intent, and remained significant once intent was controlled for. This result was obtained only for those students with an initial intent to transfer, and at a much lower level of significance than before controlling for intent. Additional investigation may be needed to fully understand how to meet the needs of African American students in navigating the transfer process. Contrary to the findings of Wang (2012), a moderating effect of enrollment intensity on the relationship between race and transfer behavior was not found for Hispanic students in the current sample. This implies that Hispanic students in Washington may be transferring at higher rates than in other places in the country.

Contrary to the findings of other researchers using national level datasets (e.g., Bailey, Jenkins, & Lienbach, 2005a), Washington students tend to state an intent to transfer more often than not, regardless of socio-economic standing; however, students of higher socio-economic standing do have higher transfer rates than other students. This implies there may be more of an emphasis on the transfer option in colleges in Washington than in other places in the country. Additional supports made available to help students follow through with their intent to transfer may be useful, with information on the process, deadlines, and requirements made readily available, as well as other assistance in accomplishing every task necessary to take advantage of the transfer opportunity.

With respect to the effects of age, analyses for the current sample are consistent with numerous prior studies: as age increases, the likelihood of transfer decreases. Younger students are more likely to transfer than older students, regardless of work status or family status, while older students who are enrolled full-time and do not have children are more likely to transfer than other older students who are enrolled part-time or who have children. Having children is related to lower transfer rates for students in the 30-39 years of

age group, regardless of whether they are single parents or parenting with another person in the home. This implies that older students, especially those between 30-39 years of age, may need additional support and options tailored for them to help balance the demands of school and family.

Participation and performance in developmental education, particularly math, has been shown in the literature to have a significant impact on transfer probabilities, with the relationship between performance and transfer status moderated by age, but not by enrollment intensity (Bahr, 2008; 2010; Calcagno et al., 2007a; 2007b). Students in the current sample who enrolled in and passed developmental English show lower transfer rates than those students who did not take a developmental English course, regardless of enrollment status. Conversely, students in the sample who enrolled in and passed a developmental math course have higher transfer rates than students who did not take a course in developmental math (also regardless of enrollment status). Regardless of subject, students who took a developmental course and did not pass it have the lowest transfer rates, with rates for part-time students lower than those of full-time students (although not statistically different).

When disaggregated by age, students under the age of 20 who have not taken a developmental education course have the highest transfer rates, regardless of subject; students 20 and older show differing results by subject. For English, not having taken a developmental course produces the highest transfer rates for older students, while for math, it is successfully *passing* a developmental course that is associated with the highest transfer rates; both these results are obtained for students aged 20-24. It is noteworthy that the gap in transfer rates between those who do not take a developmental math course and those who successfully pass a developmental math course becomes increasingly large with age. This pattern is not seen for English. This implies that students who are older may need additional assistance getting through developmental math courses.

Two specific research questions were posed to look more closely at the differences in factors that influence transfer behavior between those who have an initial intent to transfer and those who have a different intent or are undecided. A CART analysis was conducted to identify the different combinations of variables for each of these two groups that provide the highest and lowest probabilities of transfer.

The first of these questions examined students with an intent to transfer, with an aim to identify a risk profile that could function as an early warning indicator of the likelihood of not transferring. The resulting combination of variables identified that comprise this profile are: a cumulative GPA lower than 1.83, part-time enrollment, and slow credit accumulation, such that the critical threshold of 39 college level credits would not be met. A student with this profile would be at higher risk until he or she had persisted through at least nine quarters. A student who enters college far below college-ready work who is not able to attend full-time would be at greatest risk for not meeting the milestones that signal a student who is on-track with plans to transfer.

Conversely, students in this group who do transfer exhibit behaviors that are much different from those who do not. Students who transfer typically are enrolled full-time, main-

tain a cumulative GPA above 3.10, accumulate a minimum of 39 credits in the first year, and stay on track to transfer within 12 quarters of initial enrollment. In addition, students in this group are more likely to transfer if they are male, Asian, and under the age of 20.

The second question examined students who did not state an intent to transfer, but who transferred anyway: What characteristics or behaviors do they have in common with students who stated their intent to transfer, and followed through? Like those with an initial intent to transfer, they were more likely to transfer if they were under the age of 20 at the time of their first enrollment (the strongest predictor), earned a substantial number of college level credits in the first year, and had minimal or no involvement in developmental education. In addition (like those with an intent to transfer), they were more likely to transfer if they were male or Asian. Developmental education participation is a factor for these students, whereas it is not a prominent indicator for students with an intent to transfer. Enrollment in developmental education across no more than three quarters had the most impact in increasing the likelihood of transfer for students without a stated intent to transfer. Older students who do not state an intent to transfer typically exhibit low transfer rates, although a high cumulative GPA appears to be the most important indicator of an increased transfer probability.

Taken together, these results provide adequate answers to the research questions and are consistent with previous research. These analyses paint a lively portrait of the characteristics of students in Washington who do and do not transfer, and the similarities and differences between them. These results are useful in evaluating current practices and policies at individual institutions and for identifying areas of strength to build upon, as well as areas for support or improvement. They may also serve as a benchmark against which institutions can compare the profile and performance of their students. College staff engaged in identifying and assisting students who are at risk of poor academic outcomes may find these results useful in developing student risk profiles at their own institution as part of the implementation of a comprehensive early warning system for intervention.

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Appendix A. Technical notes

Variable list and definitions

	Definition	How derived or calculated
Demographic variables		
Age at CTC entry	Age in years at entry to CTC system; analytic variable is grouped: < 20, 20-24, 25-29, 30-39, 40+	
Gender	Indicator of self-reported gender at time of enrollment; 0 = Unknown, 1 = Male, 2 = Female	
Race	Categorical variable for racial groupings	Follows federal reporting definition; Hispanic is included as a separate group and is not double-counted within other racial groupings; as such, numbers will not correspond with SBCTC numbers
Economic disadvantage status	Indicator of low vs. not low socio economic standing; 0 = not low ses, 1 = low SES	Based on PELL eligibility from SBCTC ECON_DISAD_IND and WSAC student unit record data
Family status	Indicator of parenting status; 0 = Unknown, 1 = no children, 2 = Co-parenting, 3 = Single parent	Based on SBCTC FAM_STAT
Work status	Indicator of full or part-time work status; 0 = Other, 1 = full-time work, 2 = part-time work	Based on SBCTC WORK_ATTND; full-time = 12, part-time = 13 or 14, all other values = other
Enrollment variables		
Intent status	Student reported intent at initial enrollment; five categories included unknown, transfer, degree-no transfer, developmental, personal enrichment, other; rolled to three categories: Transfer, Degree, no-transfer, other	"Transfer" category derived from INTENT = B or KIND_OF_STUDENT = T or PURP_ATTND = 12; any of these override PLAN_ATTND = 14 "Other Workforce" derived from INTENT = (F,G,H,J,K,M) or KIND_OF_STUDENT = W or PLAN_ATTND =13,14 or PURP_ATTND = 11 (subordinate to both transfer categories)

	Definition	How derived or calculated
Full-time enrollment status	Indicator of full- or part-time enrollment	Based on FULL_PART_TIME_IND and calculation of average quarterly credits enrolled over entire enrollment history
Total number of quarters enrolled – all courses	Total number of quarters in which student was enrolled for any credits.	
Total number of quarters enrolled in Dev Ed	Total number of quarters in which student was enrolled for any developmental education credits, including basic education courses, regardless of whether those credits could be transcripted.	
Number of Dev Ed courses taken	Total number of developmental education courses a student enrolled in.	Includes basic education courses, regardless of whether those courses could be transcripted
Total number of college level credits earned	Total number of credits earned in courses numbered 100 and above.	Summed from transcript records; any credits not transcripted are not included
Performance variables		
First quarter credit load	Total number of credits enrolled for in first quarter of enrollment	Only credits that are transcripted are counted; some students taking non-credit or non-transcripted courses show 0 credits for first quarter of enrollment.
First quarter GPA	Grade point average for first quarter of enrollment.	Some students have no or 0 GPA, based on the transcript status of the credits they were enrolled for in the first quarter of enrollment.
First year credits earned	Total number of credits earned in the first year of enrollment.	Based on transcripted credits; see notes for First Quarter Credit Load
First year GPA	Grade point average for first year of enrollment.	Based on transcripted credits; see notes for First Quarter GPA.
DWF rate	Percent of overall credits enrolled that were dropped, withdrawn from, or failed.	Based on transcripted credits; see notes for First Quarter Credit Load.
Cumulative GPA	Overall cumulative grade point average.	Based on transcripted credits; see nots for First Quarter GPA.
Pass / no pass Dev Ed Math	Passing status for developmental math; 0 = No Pass, 1 = Pass, 99 = Did not take a dev math course	If at least one dev math course is passed, this variable is set to 1.

	Definition	How derived or calculated
Pass / no pass Dev Ed English	Passing status for developmental English; 0 = No Pass, 1 = Pass, 99 = Did not take a dev English course	If at least one dev English course is passed, this variable is set to 1.
CTC transfer status	Indicator of transfer to a 4-year institution; 0 = did not transfer, 1 = transferred.	Student is considered transfer if a record is matched for the student in the PCHEES system with at least one enrolled credit in any quarter after the initial quarter enrolled at a community or technical college.
PCHEES completion status	Indicator of whether student earned a Bachelor's degree.	Degree must be earned after the first quarter of enrollment at a community or technical college.

Longitudinal synthesis of cohort demographics

Degree production. First time bachelor's degree awards show an increasing trend, with an overall increase of 27% between 2001 and 2011; however, the rate of increase has slowed, with a 15% increase between 2001 and 2006, and a smaller increase of 11% between 2006 and 2011.

The distribution of degrees awarded in the major disciplines has remained relatively stable across time, with slightly more than a quarter of all degrees awarded in the arts and letters. Degrees in the social sciences have increased from 20% for the 2006 cohort to 24% for the 2011 graduates. Completions of STEM degrees increased, from 17% in 2006, to 23% in 2011. Degrees in business, health related disciplines, education, and other fields accounted for smaller percentages, with business degree production slightly declining over time, and health degrees slightly increasing.

The research universities consistently graduate more students with first bachelor's degrees than regional comprehensive universities or branch campuses and off-site centers,[8] producing approximately half of all first time baccalaureate earners. The majority of graduates from research universities leave with degrees in the social sciences, STEM fields, or arts and letters. Health related degrees awarded at research universities have decreased over time, from approximately one-half of all health major graduates, to one-third.

The regional comprehensive universities have steadily produced approximately one third of all graduates, although this share has decreased somewhat over time, with the largest proportion of graduates leaving with an education degree or other arts and letters degree. Branch campuses have increased their share slightly over time, moving from 8% of

8. Centers included programs offered by public baccalaureate institutions at various off-site locations and included WSU distance learning environments.

the 2001 cohort to 12% of the 2011 cohort, a third of which are arts and letters majors. The share of business majors produced by branch campuses has increased over time. Centers have held steady with the smallest percentage of all graduates, at 6%, who are primarily business and education majors.

Pre-college enrollment. Overall, 42% of the 2006 graduates took pre-college math, 6% took pre-college English, while 38% did not enroll in either, and 14% took both. This pattern was relatively stable to 2011, with a slight increase in pre-college math enrollment, decreases in pre-college English enrollment, and decreased for enrollment in both.

The largest proportions of the graduates across all cohorts who had been enrolled in pre-college math were African American, Native American, and Hispanic (more than 66% in all cases). For pre-college English, the largest proportions were Asian and African American in the early years (33% and 41% respectively), and Asian and Hispanic in the later years (32% and 29%, respectively). For both cohorts, Asians had the lowest proportion of graduates who had taken pre-college math (41 – 42%), and multi-racial (in 2006) and whites (in 2011) had the lowest proportions of graduates who had taken pre-college English (15% and 12%, respectively).

Centers, branch campuses, and regional comprehensive universities consistently have had higher proportions of graduates who took pre-college math and English, with over two-thirds of graduates in all cohorts having enrolled. In contrast, typically less than half the graduates from research universities were ever enrolled in pre-college math, and less than 20% were ever enrolled in pre-college English.

More than 50% of graduates in both cohorts in all majors except STEM took pre-college math. The proportion of STEM graduates taking pre-college math increased across the 2006 and 2011 cohorts (35% to 43%). Education majors had the highest proportion across these cohorts, at 65% and 67%. Graduates in business, education, and health related majors had the highest rates of enrollment in pre-college English ranging from 18% to 25%.

Gender, age, and race. Consistently, more graduates were female than male (approximately 56%), with graduates getting younger over time (68% under age 25 in 2009 to 72% in 2011). Younger students (under age 25) progressively used branch campuses or centers more frequently during this period (26% in 2006 to 43% in 2011). More female students took pre-college math, and more male students took pre-college English. Older graduates (above age 25) were much more likely to have taken pre-college math than younger graduates (70% compare to 47%), as well as pre-college English (21% compared to 15%).

Research universities have typically graduated the largest proportion of students from all racial categories. Students of Native American descent tended to graduate more often from the regional comprehensive universities in earlier years, shifting to the research universities over time, while the larger proportion of Hispanic students shifted to the regional comprehensive universities. Asians continue to represent the racial category with the largest proportion of students graduating from the research universities (73% in 2006 to 68% in 2011).

Transfer students compared to direct entry students. Across all three cohorts, just over half of the graduates were counted as transfer students.[9] The proportion of graduates who entered the university system as transfer students has remained fairly steady over the years, decreasing slightly from 2001 to 2011 (56% to 51% of the all graduates). The majority of these students are transfers from the community and technical college system. The proportion of direct entry students with transfer credits has increased from approximately a third of the direct entry students graduating in 2006 to approximately half in 2011.

Both male and female graduates were almost evenly split between transfer and direct entry status; slightly more graduates of both genders were transfer students, with females leading at 54% versus males at 51%. The majority of each were community and technical college transfers.

Approximately a third of the graduates in all cohorts under age 25 were transfer students from the community and technical college system. For all other age groups, two-thirds were community and technical college transfer students in the earlier years, increasing to approximately three-quarters in the later years.

Hispanic and Native American students had the highest transfer rates across the cohorts, showing a slightly decreasing trend ranging from 58% to 53%. White students and African American transfer students were represented in all cohorts at more than 50%. Asian students had the lowest rates of transfer, at less than 42% across cohorts. For all racial groups, most students who transferred came from the community and technical college system.

Students graduating with business, health related, or education degrees were most often transfer students from the community and technical college system. Students majoring in education had the highest overall proportion of community and technical college transfer students, and STEM fields had the highest proportion overall of direct entry students. Nearly 60% of graduates at research universities and 50% of graduates at regional comprehensive universities were direct entry students. The division for the branch campuses and centers was reversed, with almost 90% of the graduating cohorts having transferred in. The percentage of transfer students coming into the branch campuses and centers from the community and technical college system has increased over time, ranging from 72% to 93% across the cohorts.

9. Students with a degree from the community and technical college system, or who were transferring 40 or more credits, of which at least 20 were from a community or technical college, were considered community and technical college transfers. Students with no degree and less than 40 credits transferred in were considered direct entry students. Those with 40 or more credits being transferred from somewhere other than the community and technical college system were considered in the category of "other transfers."

Full literature review for study variables

Student demographics

Gender. Being female has been associated negatively with transfer, even after controlling for marital status and parenting status (Bailey, Jenkins, & Leinbach, 2005b; Eddy, Christie, & Rao, 2006; Mohammadi, 1994; Surette, 2001). Surette (2001) also noted that females are more likely than males to *attend* community college, even though they are less likely than males to *transfer* or *complete* a bachelor's degree. Bailey, Jenkins, and Leinbach (2005b) found inconsistent results in that while females were found to be less likely than males to transfer, they completed a bachelor's degree at higher rates after transfer than did males. Findings by Dougherty & Kienzl (2006) were both consistent as well as contrasting regarding transfer probabilities, and they hypothesized that their results were most likely due to changes in social norms and a shift in the expression of traditional gender roles; their analyses examined changes in behavior across several decades. In contrast to these findings, Fikes and Fikes (2008) found no relationship of gender to transfer probability after controlling for covariates.

Age at entry. Research has shown that the older a student is at initial enrollment, or the longer the delay of enrollment after high school graduation, the less likely it is that a student will transfer or complete a credential (Berkner, He, & Cataldi, 2002; Dougherty & Kienzl, 2006; Hagedorn, Cypers, & Lester, 2008). Conventional wisdom presumes that older students who enroll at a 2-year institution are less likely than younger students to transfer and complete a credential because of life-style factors, such as work and family responsibilities, which constrain their time and resources and force them to attend college on a part-time basis. Calcagno, Crosta, Bailey and Jenkins (2007a) challenged this assumption in a study using even history modeling. After controlling for cognitive ability in math, they found evidence that suggests older students have a higher conditional probability of graduating than younger students. They propose it is the time away from formal education and the subsequent need for refresher work in math that absence creates that is an obstacle to success. They conclude that age at entry matters, but not for the reasons usually presumed.

Age at entry appears to also have an impact on the paths that students pursue. Porchea, Allen, Robbins, and Phelps (2010) found that students who are older are more likely to obtain a two-year degree and not transfer than to drop out of college. In comparison, younger students are more likely to transfer to a 4-year institution without a 2-year degree than to drop out. Dougherty & Kienzl (2006) found that the impact of age on the probability of transfer is an inverse relationship; the older a student is at college entry, the less likely they are to transfer. In follow-up analyses to identify possible reasons for this difference, they found that intent, parenting status, college major, and enrollment status (full-time vs. part-time) moderate the effect of age on probability of transfer.

Race and ethnicity. A growing body of literature is devoted to understanding the differences in outcomes between racial groups, particularly for students of African American or Hispanic background. Findings consistently highlight a sizable transfer gap between

white students, and African American and Hispanic students, with some studies noting transfer rates for white students that are as much as twice that of non-white students (Bailey, Jenkins, & Leinbach, 2005b; Hawley & Harris, 2005). Further, the bachelor's degree completion rates for African Americans and Hispanics were found to be extremely low, less than half the rate of white students. Asian students consistently transfer at rates higher than white students, but the bachelor's degree completion rates have been noted as lower than those of white students (Bailey, Jenkins, & Leinbach, 2005b).

Contrary to these findings, Dougherty and Kienzl (2006) did not find any effect of race on the probability of transfer. They noted that despite the fact there is a gap in the percentage of transfers for African Americans and Hispanics from those for white students, these differences were not statistically significant. The one exception noted to this was for African American students after controlling for academic intent (intent to pursue a baccalaureate degree or not). When African American and white students who shared similar academic intents were compared, the differences in transfer rates between them increased sharply and were found to be statistically significant.

Other studies have also noted mediating and moderating factors for the relationship between racial background and transfer outcomes. Adequate high school preparation and full-time enrollment were found to mitigate the effects of race in a study by Wang (2012). A noteworthy finding in Wang's study was that the effect of being Hispanic was completely mitigated by full-time enrollment, whereby the probability of transfer for Hispanics enrolled full-time was no longer statistically different from the probability of transfer for white students also enrolled full-time.

Socio-economic background. There is considerable evidence that suggests students from lower socio-economic backgrounds do not have as high a probability of transferring or completing a bachelor's degree as other students from more affluent backgrounds (Bailey, 2004; Bailey, Jenkins, & Leinbach, 2005a, 2005b; Dougherty & Kienzl, 2006; Eddy, Christie, & Rao, 2006; Roksa, 2006; Wang, 2012). Further, students from low socio-economic backgrounds are much more likely to state an intent to gain job skills, while students from high socio-economic backgrounds are more likely to state an intent to pursue a degree or transfer (Bailey, Jenkins, & Leinbach, 2005a). In contrast, Adelman (2005) did not find a significant effect of socio-economic status on transfer behavior.

Family and work status. In a study by Schmid and Abell (2003), differences between community college students who graduated and those who were non-returners were examined with respect to a variety of student characteristics. Among those characteristics that differentiated between these groups, working full-time was found to be more prevalent among the non-returners, as was part-time enrollment. There were no significant differences found between the groups for parenting status. Dougherty & Kienzl (2006) obtained slightly discrepant results in that having no children and working less than 40 hours a week were found to be significant, positive predictors of transfer to a 4-year institution in their study of factors impacting transfer behavior. Confirming these results, participation in employment at less than 40 hours per week has been found to be positively related to

transferring to a 4-year institution, and negatively related to obtaining a credential from a 2-year institution (Porchea et al., 2010). After controlling for age, income, first-generation status, and initial intent, LaSota and Zumeta (2015) estimated that working no more than 19 hours per week increased the probability of transfer as much as 59 percent over that of students who worked 20 hours a week or more.

Enrollment characteristics

Intent. Early discussions about how to measure institutional effectiveness established the idea that measures of student intentions should be the foundation for examining later outcomes (American Association of Community Colleges [AACC], 1994). In affirmation of this idea, Voorhees and Zhou (2000) in their early research asserted that transfer rates can only be properly understood in the context of student intentions. In their study, they examined shifts in student intentions in relation to demographic and performance characteristics including gender, age, race, total number of credits earned, and transfer status. Findings suggested that student intentions remain relatively stable across time, as nearly 80 percent of students in the sample indicated the goals they stated at enrollment had not changed. For those students whose goals did change over time, the shifts most commonly were from career oriented aspirations to more academically oriented goals, e.g., from upgrading job skills to earning a certificate or completing an Associate's degree. Shifts in student intention were positively related to credit accumulation only, and not related to gender, age, or race, and also did not appear to be related to goal attainment. These results have been confirmed by other researchers (Bailey, Jenkins, & Leinbach, 2005a).

Many studies have found student intent to be one of the strongest predictors of whether a student transfers and completes a bachelor's degree, with recent research estimating that students who plan to transfer at the time they enter a community college are 21 percent more likely to transfer than students with other intents (LaSota & Zumeta, 2015). Students who initially state transfer or degree completion as their intent are more likely to achieve it than students with no intent or who have a different intent at initial enrollment (Bailey, Jenkins, & Leinbach, 2005a; Bradburn, Hurst, & Peng, 2001; Dougherty & Kienzl, 2006; Horn, 2009; Mohammadi, 1994; Porchea, et al., 2010). This is especially true for students of Hispanic background. In general, a higher proportion of Hispanic students than white or African American students have educational aspirations aimed at baccalaureate attainment, and while these aspirations for educational advancement serve to increase transfer success for Hispanics, the gap in transfer rates between Hispanics and white students remains a statistically significant gap (Bailey, Jenkins, & Leinbach, 2005a). African American students have also been noted to have educational aspirations for higher degree attainment in greater proportions than white students, which when controlled for, reveal a significantly lower transfer rate for African American students than for white students (Dougherty & Kienzl, 2006).

Enrollment intensity. Findings summarized from five years of data collected by the Center for Community College Student Engagement, administrators of the Community

College Student Survey of Engagement (CCSSE), shows that students who attend part-time are at a greater risk for not achieving their educational goals (Center for Community College Student Engagement, 2007).

Enrolling full-time has been found to be strongly related not only to completion of a credential at a 2-year institution, but also to transferring to a 4-year institution (Adelman, 2006; Crosta, 2014; Doyle, 2009; Eagan & Jaeger, 2009; Hoachlander, Sikora, & Horn, 2003; LaSota & Zumeta, 2015; Porchea et al., 2010). Eagan and Jaeger (2009) found that part time enrollment decreased the probability of transfer by 12 percent compared to students enrolled full-time. They assert that because part-time students take longer to accumulate the credits to be transfer eligible, they are more at risk to become discouraged and give up on the pursuit of transfer to a 4-year institution, or may have goals other than earning a 4-year degree. In addition, since part-time students are not engaged at the college campus as much as full-time students, they may be less likely to have the exposure to the information and resources regarding the transfer process they need to successfully make the transition. In a more recent study using data from the Beginning Postsecondary Student Longitudinal Study of 2003-2009 national dataset (BPS:09), LaSota and Zumeta (2015) calculated the decrease in probability of transfer at 19 percent for students who attended primarily part-time, as compared to students who have attended in a mixed pattern of full-time and part-time.

Performance variables

Developmental education. Bettinger and Long (2005) examined data on students who enrolled as traditional-aged, first-time freshman in the fall of 1998 in any of the community colleges in Ohio, and tracked their outcomes for five years. Among students attending full-time, they found that those who had taken developmental courses accumulated fewer credits than students who did not take developmental courses, were more likely to stop out without a completion, less likely to transfer, and less likely to have completed either a two or four-year degree. Results for part-time students were similar, with the exception of credit accumulation. Part-time students who had taken developmental courses completed more credits on average than part-time students who had not taken any developmental courses. Further, they found that 64 percent of females compared to 54 percent of males, and as high as 75 percent of African American and Hispanic students compared to 55 percent of white students, were placed in developmental math courses. Similarly disproportionate numbers were found for developmental English courses. However, despite these pronounced differences, when all background characteristics were controlled for in a regression analysis, participation in developmental courses of either subject did not have a negative impact on degree completion, and demonstrated a small positive effect on credit accumulation and transfer outcomes.

Crisp and Delgado (2013) conducted similar analyses, using propensity score matching to control for selection bias, and multi-level modeling to account for student and institution level variables. Results included a negative impact on transfer outcomes of develop-

mental course-taking for both math and English. These results held even after controlling for background characteristics of students. In light of the seeming contradiction between these results and those of Bettinger and Long (2005), it is likely that institutional characteristics play a role in whether developmental education helps or hinders a student in realizing transfer aspirations. Additional research using multi-level models to identify the interactions between student and institutional level variables is needed to gain insight as to when and why developmental education is helpful to a student.

Successfully passing developmental courses, in contrast to enrollment, has been explored by a number of researchers (Attewell, Lavin, Domina, & Levey, 2006; Bahr, 2008, 2010; Bettinger & Long, 2004; Calcagno, Crosta, Bailey, & Jenkins, 2007b; Fikes & Fikes, 2008). Bahr (2008; 2010) found evidence to suggest that students who are successful in developmental courses are just as likely to transfer as those students who pass college level math without having taken a developmental course first. In a follow-up study, Bahr (2013) further qualified this relationship by providing evidence that as the time a student is enrolled in developmental courses because of repeated failure or because of a low initial placement level increases, meaning more courses are needed to get to college level proficiency, the probability of transfer decreases.

Fikes and Fikes (2008) looked at the effect of passing developmental courses on first year retention of first-time-in-college students enrolled at a community college in Texas. They found that students who successfully completed either a developmental math or developmental reading course had higher probabilities of being retained than students enrolled in these courses who were unsuccessful. Further, those students who placed in developmental math, but did not enroll, had lower probabilities of being retained than students who enrolled but were unsuccessful. These results did not hold for developmental reading, however. Students who did not successfully complete the developmental reading course they had enrolled in had lower probabilities of retention than those students who placed in developmental reading, but did not enroll.

The impact of developmental education appears to have differential effects based on age at entry to college. In a study using discrete-time hazard modeling, Calcagno and his colleagues found that independent of age, participation in developmental education was negatively related to college graduation; however, when age was added to the model, the effect was stronger for younger students than for older students, meaning the decrease in the probability of graduating was less for the older students than for the younger (Calcagno et al., 2007b). Further, these researchers found that when this relationship was disaggregated by subject, additional differences between older and younger students were noted. The effect of enrolling in a developmental writing course was equal for younger versus older students, but for enrollment in a developmental math course, the effect was much stronger for younger students than older. This finding indicates that the negative effect of participation in developmental education on college graduation is limited to developmental math, and has a larger impact on younger students than older.

First-quarter credit load. Doyle (2009) found that students who took more than 12

credits in their first semester of enrollment increased their probability of transfer by 11-15 percent over a six-year period, controlling for all other variables. Attewell, Heil, and Reisel, (2012) offer confirming evidence of Doyle's (2009) findings and advance the concept of academic momentum as a predictor of degree completion in their study of the relationship of a student's initial credit load and other factors that support momentum. Using the National Education Longitudinal Study of 1988, cohort of 2000 data (NELS:88/ 2000), which tracks a cohort of students from the 8th grade through the spring of 2001, these researchers tested several different models and found that enrolling part-time and taking fewer than 12 credits in their first semester significantly lowered the probability of any type of degree completion by more than 13 percent, even after controlling for other background characteristics.

GPA. Earning a higher GPA in the first year of enrollment has been related to increases in the likelihood of transfer (Eagan & Jaeger, 2009). These researchers also tested the effect of overall cumulative GPA, with similar results. Hawley and Harris (2005) found a positive relationship for cumulative GPA with retention in a model that performed at a 79 percent rate of accuracy in correctly classifying students as retained or not retained. In multi-level models tested by LaSota and Zumeta (2015), a .1 increase in the first-year GPA was found to raise the transfer probability by 58 percent over the average.

Dropped, withdrawn, failed rate (DWF). In a study of transfer-ready community college students, Adelman (2005) found that those students who dropped more than 20 percent of their credits were less likely to transfer than students whose drop rate was less.

Summary of academic literature

In sum, the literature that examines the predictors of transfer and baccalaureate degree completion presents consistent results over time. Students from higher socio-economic backgrounds who do not delay entry to college, who enroll full-time, and take and pass developmental courses as needed have higher probabilities of successfully transferring to a 4-year institution. When students intend on earning a baccalaureate degree, do not drop courses, and earn good grades, they increase their chances of earning a 4-year degree. Some findings contradictory to this profile have been noted; however, these are most likely due to differences in samples, methods, and variable definitions.

The interactive influences of these variables have also been explored to identify their unique and combined effects on student outcomes. Specifically, age, enrollment intensity (full-or part-time), and student intent were identified as predictors of transfer behavior that are mediated or moderated by other variables. Selected combinations are examined with descriptive techniques in the present study to explore how Washington student outcomes compare with results reported here from the academic literature.

Appendix B. Figures and tables

Walk-through of CART diagrams

Students with a transfer intent

Confirming the assertion of Voorhees & Zhou (2000) that transfer behavior is best understood in the context of student intent, the most powerful distinguishing variable is student intent. Students who stated an initial intent to pursue transfer to a 4-year institution have a 38 percent probability of realizing that goal, compared to a 13 percent probability of transfer for those who stated an intent other than transfer at initial enrollment.

Among those who expressed an intent to transfer, the next most powerful predictor of transfer is the cumulative GPA at the time of exit from the 2-year institution. Students whose cumulative GPA is at least 2.35 have an increase in probability of transfer from 38 percent to 42 percent. Students who earned a GPA of less than 2.35, but higher than 1.83, have a decrease in probability of transfer from the initial 38 percent to 25 percent. A cumulative GPA of less than 1.83 drops the probability of transfer for these students to just over ten percent.

For low-performing students (cumulative GPA < 2.35), the next most important factor in the likelihood of transfer is the total quarters of enrollment. Those students enrolled for at least nine quarters and attending full-time show an increase in transfer probability to 34 percent; if attending part-time, that probability is only 25 percent, but increases to 36 percent if the student has not enrolled in developmental education courses. If the student has enrolled in developmental education, that probability drops to 23 percent. If low-performing students enrolled for less than nine quarters, but earned a cumulative GPA of at least 2.15, the probability of transfer is 25 percent; if the cumulative GPA is less than 2.15, that probability drops to 16 percent.

For students with a cumulative GPA higher than 2.35, the number of credits earned the first year is the next most important factor in the likelihood of transfer. Students with more than 39 college level credits earned in their first year of enrollment have an increase in transfer probability to 51 percent, compared to 37 percent for students who do not meet this critical threshold. For the current sample, this variable appears to be an important point of departure along the path through college that distinguishes those who transfer and those who do not, as the combination of factors that impact transfer probabilities grows exponentially from this point on. The subsequent pathways resulting for students with more than 39 college level credits are displayed in Figure 10.

Total quarters enrolled is the next determining variable in the sequence, regardless of whether a student did or did not meet the credits earned threshold for the first year of enrollment. For those who met the 39 credit threshold, the critical number of enrolled quarters is 12; for those who did not meet the threshold, the critical number is 15.

For students who met the credit threshold for college level credits earned in the first year of enrollment, having enrolled for a total number of quarters under 12 increases transfer probability to 54 percent, compared to 39 percent for students who were enrolled for a total of more than 12 quarters. Students enrolled for less than 12 quarters who are under the age of 20 at the time of their first enrollment, who earn a cumulative GPA of 3.10, and who are male have a cumulative probability of transfer of 68 percent. Students with less than 12 quarters of enrollment who are *over* the age of 20 and male have a 58 percent probability of transfer if they earn a cumulative GPA of at least 2.97. A lower cumulative GPA drops the transfer probability to 41 percent. Older female students have a transfer probability of 44 percent, regardless of GPA.

Students who enrolled for more than 12 quarters, but fewer than 15, and who are male have a transfer probability of 49 percent, regardless of GPA, and female students in this group have a transfer probability of 54 percent if they are of Asian, Pacific Islander, or of multi-racial background. Female students of other racial backgrounds have a transfer probability of 37 percent.

Pathways for low credit-earning students are displayed in Figure 11. Students who did *not* meet the 39 college level credit threshold for credits earned in the first year of enrollment and who enrolled for fewer than 15 quarters have a transfer probability of 40 percent, which is 14 percentage points lower than higher credit earners enrolled for fewer than 12 quarters. This probability goes up to 53 percent if they are under the age of 24, male, and have earned a minimum cumulative GPA of 2.93. Male students over the age of 24 who are low credit-earners have to earn a cumulative GPA of at least 3.23 to achieve a 44 percent transfer probability. Females over the age of 24 in this group who have taken developmental math have a 38 percent probability of transfer, compared to a 28 percent transfer probability for those who have not taken developmental math.

Female students under the age of 24 who come from a higher social-economic background and have a DWF rate of less than 19 percent have a transfer probability of 44 percent, compared to 30 percent for females with a higher DWF rate. If female students under the age of 24 are from a lower socio-economic background, they need a cumulative GPA over 3.54 to boost their probability of transfer to 43 percent. A cumulative GPA less than this results in a lower transfer rate, at 32 percent.

If students did not meet the 39 college level credit threshold for credits earned in the first year of enrollment and enrolled for more than a total of 15 quarters and are male students of Hispanic, Asian, Pacific Islander, or multi-racial background, they have a transfer probability of 42 percent, compared to male students of other racial backgrounds whose transfer probability is 29 percent. Female students in this group have a transfer probability of 25 percent, regardless of racial background.

Students with an intent other than transfer

Figure 12 shows all the relevant pathways to transfer for students who express an intent at initial enrollment other than transfer. These students have a transfer probability of

13 percent. Among these students, age is strongest indicator of who will transfer. Students in this group under the age of 20 have an increased probability of transferring of 21 percent when compared to older students, whose probability of transfer decreases to ten percent. As is seen for students with a transfer intent, college level credits earned in the first year is a powerful predictor, but has a much lower threshold for this group. For students under the age of 20, this variable increases the probability of transfer to 32 percent with a threshold of just over five college level credits. For students of Asian background or students of a racial background categorized as "Other," this probability increases to 43 percent, compared to 23 percent for students of other racial backgrounds. Further, young students who earned more than five college level credits, and who are of Asian background, maintain a cumulative GPA of 2.61 or better, and who take developmental courses for fewer than three quarters have a transfer probability of 53 percent. *More* than three quarters of developmental education brings the transfer probability down to 37 percent, and a GPA of less than 2.61 reduces it further to 30 percent.

For young students who earn less than a total of five college level credits their first year, the transfer probability drops to 18 percent, but increases to 21 percent if the total number of college level credits earned over the entire history of their enrollment is greater than 84.95; earning fewer than 84.95 college level credits drops it to 11 percent. For students who earn more than 84.95 college level credits, the probability of transfer increases to 23 percent if more than 51.7 of those credits are earned in the first year of enrollment, and to 34 percent if the student is African American, Asian, Native Hawaiian, or Alaskan Native. This increases even further to 46 percent if the student has never taken a developmental math course; those who do take developmental math and pass it have a transfer probability of 28 percent. Students of other racial backgrounds with more than 51.7 of their credits earned in the first year of enrollment have a transfer probability of 22 percent, which drops to 17 percent if developmental math has not been taken, but increases to 24 percent if developmental math is taken and passed. Students not taking developmental math increase their transfer rate even further to 27 percent if the total number of quarters enrolled is less than 15. Enrollment for more than 15 quarters results in a transfer probability of 18 percent.

The probability of transfer for older students appears to hinge on the total number of college level credits earned. Those students who earn more than 74.75 college level credits have a transfer probability of 12 percent, compared to five percent for older students who earn fewer credits. Enrolling in more than two developmental courses leads to an increase in transfer probability to 13 percent for students older than 29 years of age, and 22 percent for those students age 25 to 29 who have a cumulative GPA of more than 3.22. Students in this age group with a cumulative GPA of less than 3.22 have a transfer probability of 15 percent. For students between the ages of 25 and 29 who take fewer than two developmental courses, the transfer probability drops to eight percent. For those between the ages of 20 and 24 who take fewer than two developmental courses, the transfer probability increases to 16 percent if the number of credits they enrolled in for their first quarter is less than 15.45. Students in this group enrolling for more than 15.45 credits have a decreased transfer probability of six percent.

Summary

Based on the results of analyses for the current study sample, cumulative GPA, college level credits earned in the first year, and total number of quarters enrolled are the major factors that distinguish between those who transfer and those who do not for students in this sample with an initial intent to transfer. After accounting for the major impact of these variables, minor impacts of demographic differences (age, race, gender, socio-economic status) and academic behavior variables (DWF rate and developmental education participation) account for some variation in transfer probability for different pathways. Overall, among students who expressed an initial intent to transfer, male students under the age of 20 who earn a minimum of 39 credits their first year of enrollment, earn a cumulative GPA of 3.10, and are enrolled for 12 or fewer quarters total before transferring are the most likely to transfer. In contrast, for this group of students (those who express an initial intent to transfer), students of any gender, age, or race who enroll part-time, earn a cumulative GPA of less than 1.83, and are enrolled for a less than nine total quarters, are least likely to actually transfer.

For students in this sample who expressed an intent other than transfer at initial enrollment, age, credit accumulation for the first year and overall, cumulative GPA, and the number of developmental courses taken are the major factors distinguishing those who ultimately transfer from those who do not. Participation in developmental education improves or hinders the probability of transfer depending on the race of the student. Despite not expressing an initial intent to transfer, students under the age of 20, who are Asian or of a racial background categorized as "Other," who maintain a cumulative GPA of 2.61 or better, and are enrolled in developmental education courses for fewer than three quarters are most likely to transfer.

Figure tables

Table B1. Transfer rates disaggregated by race and intent.

	Transfer rates		
	Transfer	Earn degree, no transfer	No degree, no transfer
African American	32%	14%	12%
Alaska Native	24%	8%	10%
American Indian	33%	13%	11%
Asian	42%	21%	20%
Hispanic	35%	13%	12%
Multi-racial	39%	17%	14%
Native Hawaiian	33%	10%	11%
Not reported	41%	12%	18%
Pacific Islander	41%	16%	0%
White	38%	12%	11%
Other	40%	15%	16%

Table B2. Transfer rates disaggregated by SES status and intent.

	Transfer rates		
	Transfer	Earn degree, no transfer	No degree, no transfer
Not PELL Eligible	41%	13%	13%
PELL Eligible	35%	13%	13%

Table B3. Transfer rates disaggregated by age and intent.

	Transfer rates		
	Transfer	Earn degree, no transfer	No degree, no transfer
<20	41%	18%	24%
20-24	37%	14%	13%
25-29	34%	12%	10%
30-39	31%	9%	7%
>40	26%	8%	6%

Table B4. Transfer rates disaggregated by race and enrollment intensity.

	Transfer rates	
	Part time	Full time
African American	20%	23%
Alaska Native	15%	20%
American Indian	21%	23%
Asian	28%	39%
Hispanic	22%	30%
Multi-racial	26%	35%
Native Hawaiian	20%	25%
Not reported	24%	26%
Pacific Islander	23%	33%
White	23%	29%
Other	28%	34%

Table B5. Transfer rates disaggregated by age and enrollment intensity.

	Transfer rates	
	Part time	Full time
<20	30%	38%
20-24	26%	27%
25-29	20%	22%
30-39	15%	16%
>40	12%	10%

Table B6. Transfer rates disaggregated by developmental education performance and enrollment intensity.

	Transfer rates	
	Part time	Full time
Pass Dev English	18%	27%
Fail Dev English	14%	20%
Did not take Dev English	25%	30%
Pass Dev Math	25%	33%
Fail Dev Math	16%	18%
Did not take Dev Math	22%	26%

Table B7. Transfer rates disaggregated by family status and age.

	Transfer rates				
Age	<20	20-24	25-29	30-39	>40
No children	36%	30%	25%	18%	10%
Co-parenting	31%	21%	17%	15%	13%
Single parent	24%	15%	16%	15%	14%
Unknown	37%	25%	19%	12%	9%

Table B8. Transfer rates disaggregated by work status and age.

	Transfer rates				
Age	<20	20-24	25-29	30-39	>40
Other	35%	24%	18%	13%	11%
Part time work	36%	29%	24%	17%	14%
Full time work	30%	26%	23%	19%	13%

Table B9. Transfer rates disaggregated by developmental education performance and age.

	Transfer rates				
Age	<20	20-24	25-29	30-39	>40
Pass Dev English	29%	21%	16%	14%	11%
Fail Dev English	23%	17%	17%	10%	4%
Did not take Dev English	37%	28%	22%	16%	12%
Pass Dev Math	34%	28%	24%	20%	16%
Fail Dev Math	23%	15%	12%	10%	8%
Did not take Dev Math	37%	25%	18%	11%	8%

Appendix C. Limitations and future research

Limitations

There are several limitations to this study to consider when reflecting on the implications of these findings. First, the study sample is based on enrollment during a specific quarter, as opposed to a cohort of students beginning enrollment at the same time. Even though this study can be characterized as a longitudinal study, the emphasis of the analyses was on identifying where the relationships exist between characteristics of students and their experience and outcomes, and not on following a cohort of students over time to identify cohort effects. This subtle difference in how the sample is constructed may account for differences in results from studies using a traditional cohort design. Further, the results obtained in this study can only be applied to the study sample; replication of the analyses should be done on other samples from more recent timeframes to confirm that the patterns noted are due to the hypothesized relationships and not simply an historical artifact specific to the study sample.

Second, the data used for this study are administrative records collected from individual colleges via a statewide system. Some studies use national datasets based on special surveys of cohorts of students randomly sampled from across the nation; others use administrative records from specific colleges; still others use similar statewide data collection systems to extract records for research purposes. This may contribute to lesser comparability of the results from this study with other research findings. Further, administrative data typically does not encompass the full range of variables that might explain outcomes of interest; results should be interpreted with an awareness that other intervening variables may be exerting influence and could potentially change the relationships noted were they to be included in the analyses.

Third, because the data used for this study are administrative data, the data records may not be complete, or may contain errors that have not been resolved in data cleaning procedures. A sophisticated identity matching process has been applied to these data in order to link records from multiple data systems for an individual; however, any matching procedure has a certain amount of inherent error, and there may be some records that have been linked that are actually for two different people, or conversely, that have not been linked when they should have been. Circumstances such as these are sources of error in the data and could potentially alter the results. That noted, with a large sample size such as what was available for the present study, the impact of such errors is expected to be minimal.

Fourth, no censoring of the data was done or procedures applied to account for missing data, with the exception of the deletion of records for one student with extreme outlying values on some variables. Examination of variable descriptives and distribution parameters suggested the data did not meet the usual assumptions of normality required for most parametric statistical tests. Non-parametric tests were used instead to manage this limitation.

Future directions

This study is the first in a planned series investigating the outcomes of transfer to a 4-year institution and completion of a baccalaureate degree for students in the community and technical college system in Washington State. Characteristics of students and their experience during their enrollment at a 2-year institution were examined to identify factors that promote or hinder transfer and completion behavior. Others categories of variables that could be investigated in future installments to this series include institutional characteristics of both 2-year and 4-year institutions, characteristics of students' high school experiences and the secondary schools they have attended, and course-taking patterns in both high school and college. Other studies could be conducted to collect data on intra-psychic processes that are likely to impact student behavior and performance, such as growth mindsets, student engagement in the classroom and with the institution, and perceptions of efficacy. Qualitative studies using interview, focus group, or ethnographic research designs may also help illuminate the complex processes by which students initiate, persist in, and complete a journey through post-secondary studies.

Based on the findings of the present study, future investigations of particular interest are those that examine the differential effects of race and economic status in combination with socio-emotional variables. Studies such as these may help untangle the effects of culture and class on the decision process students are confronted with in navigating the education system. In addition, because findings suggest that participation in developmental education has a significant impact on student outcomes, investigating the placement procedures and instruments used by colleges in that process would likely provide valuable insight for revisions to the process to maximize benefits for students. Finally, the relationship of time enrolled to desired outcomes should be further investigated to determine with more precision the optimal amount of time for a student to be enrolled in pursuit of transfer. Findings from the present study suggest that this relationship is non-linear, and that there is a "point of diminishing returns" after which total time enrolled begins to work against a student.

Thoughtful consideration of these and other related inquiries holds the promise of deeper insights needed to formulate, test, revise, and implement sound policy, practice, and intervention efforts that result in higher rates of transfer for all student groups, and better odds of success in educational endeavors and pursuits of fulfillment in life beyond college.

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