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## Transition to College: Nonacademic Factors that Influence Persistence for Underprepared Community College Students

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Transition to College: Nonacademic Factors that Influence Persistence for  
Underprepared Community College Students

by

Ann Paulson

A DISSERTATION

Presented to the Faculty of  
The Graduate College at the University of Nebraska  
In Partial Fulfillment of Requirements  
For the Degree of Doctor of Philosophy

Major: Educational Studies  
(Educational Leadership & Higher Education)

Under the Supervision of Professor Brent Cejda

Lincoln, Nebraska

December, 2012

Transition to College: Nonacademic Factors that Influence Persistence for  
Underprepared Community College Students

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University of Nebraska, 2012

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Community colleges provide access to higher education for a broad range of students. The majority require “remedial” coursework in reading, writing and, especially, math. Most students who begin with this remedial coursework do not go on to earn a certificate or degree. Low levels of college graduation have high direct cost, adversely affect the U.S. economy and contribute to socioeconomic inequity.

The literature review shows that both academic and nonacademic factors influence both completion of remedial coursework and completion of first year in college. It introduces research on a variety of strategies for increasing completion and persistence for underprepared students.

The purpose of this *ex post facto* study was to identify nonacademic factors that may influence the ability of underprepared, community college students to transition into college-level work and the extent to which these factors could be used to predict persistence. Logistic regression was used to analyze the effect of gender, race/ethnicity, age, enrollment status (full- or part-time), receipt of financial aid, family status and purpose. Each factor was evaluated with the other six factors held constant. The dependent variable was the completion of 15 college-level credits. The population for this

study was students in the Washington State system of 34 community colleges. Records for 15,177 students were considered.

The findings reflected that at least one category in each of the seven variables had a statistically significant relationship with persistence at the .05 level. The best predictor of student success in transition was enrollment status (full- or part-time) followed by race/ethnicity, gender, receipt of financial aid and family status. The findings are significant because they direct further research into the factors and experiences that influence success, and point toward practices to address gaps.

## **Acknowledgements**

I would like to acknowledge my advisor, Dr. Brent Cejda, and thank him for his support and direction throughout my program. I especially appreciate his generous and thorough feedback on my many dissertation drafts. Many thanks to Houston Lester and the NEAR Center at UNL. Without his help, the statistical analysis would not have been possible.

I would like to thank David Prince, Director for Research and Planning at the Washington State Board for Community and Technical Colleges, for supervising my internship and introducing me to this data, and then allowing me to use the data for this dissertation. I would like to thank Dr. William Moore, Project Director, Transition Math Project, Washington State Board for Community and Technical Colleges, for his continued support and insight on this research.

Thank you to all of the many people who have had smart, interesting conversations with me about this work: in airports, in hotel lobbies, at parties, in pubs, in teahouses, at family reunions, at conferences, at retreats, on various campuses and on Skype, telephone and email. Your hours, interest and insights have made this research valuable.

Thanks, finally, to Bo and Max for being steady, as always.

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## **Chapter 1**

### **Introduction**

The community college has multiple missions, answers to multiple stakeholders and serves diverse communities and students. A key role the community college plays is to be an open access institution that provides educational opportunity for students who are not academically prepared for college-level coursework (Cohen & Brawer, 2008). This student group is likely to need one or more pre-college-level classes in reading, writing or math. Fifty eight to 60% of community college students need to take this remedial coursework (Adelman, 2004; Attewell, Lavin, Domina, & Levey, 2006; Bailey, Jeong, & Cho, 2010; Bettinger & Long, 2005; Dowd, 2007). This is more than twice the percentage of students who begin at four-year colleges and require such remediation (Attewell et al., 2006). The majority of remediation required is in the area of mathematics (Bailey et al., 2010).

This remedial requirement creates a barrier to college success, since the majority of students placed into remediation do not complete the recommended sequence of developmental courses (Bailey et al., 2010; Rutschow & Schneider, 2011). This high percentage of students is problematic because across the country, only 25% of the students who take a remedial course at community colleges go on to earn a certificate or degree (Attewell et al., 2006). If a student enrolls in a remedial course, they are less likely to graduate than students who start with college-level courses (Calcagno, Crosta, Bailey, & Jenkins, 2007).

## **Problem Statement**

Community college students, therefore, are significantly deterred from completing their goals because of their need for remedial courses, and some groups are even more impacted than others. According to Bailey et al. (2010), factors negatively affecting completion of remediation included being African American, male, older, part-time, vocational, and Hispanic. Factors affecting students' persistence to complete the first year of college include socioeconomic status (Fike & Fike, 2008; Garcia, 2000; Ishitani, 2006; Johnson, 2006), financial aid (Fike & Fike, 2008; Ishitani, 2006; Stewart, 2010) (although Garcia found financial aid not to be a factor), parent's education (Fike & Fike, 2008; Ishitani, 2006) (although Johnson, 2006, found this not to be a factor), part-time status (Fike & Fike, 2008; Johnson, 2006), using school support services (Fike & Fike, 2008, Garcia, 2000), being Hispanic (Ishitani, 2006), and being older (Calcagno et al., 2007) (although Hagedorn, 2005, found course completion to increase with age). These are critical issues in community colleges, where students are more likely to be ethnic minorities, older, part-time, vocational, financially independent, lower socioeconomic status, and first-generation college students than the student body at four-year colleges and universities (Cohen & Brawer, 2008).

There are significant costs related to remediation and the low rates of completion and graduation for students who begin in remedial courses. Most obviously, there is the direct cost of the remediation itself. The high cost of remediation has become an issue in states across the country. Many legislators, and tax-payers, see paying for these pre-college classes as paying twice: once to prepare in high school, a second time to remediate in college. In 1998 it was estimated that public colleges spent 1-2 billion a year

just on remedial education. In the state of Florida alone, remediation in 2004-2005 costs 118.3 million (Bahr, 2008b). Bahr puts the total direct and indirect public and private costs in the U.S. at nearly 17 billion dollars annually.

Low completion and graduation rates have an even greater cost to the United States economy. Students' failure to complete a certificate or degree has a significant impact on the American labor market and economy. From the period of 2010 to 2020 the education and skill requirements for jobs is expected to rise at the same time the education and skills of the workforce will decrease (Baum, Ma, & Payea, 2006; Kelly, 2005). The jobs requiring some college are projected to increase significantly. From 2008-2018 the requirement is expected increase from 87.7 to 101.6 million (Carnevale, Smith, & Strohl, 2010). Since each increase in education is positively associated with an increase in personal income (Baum et al., 2006; Kelly, 2005), lower education level and less job availability will have a substantial influence on both social and economic conditions in the U.S. Results may include a rising U.S. poverty rate, greater gap in the standard of living, loss of jobs to countries with better-educated workforces, and declining international competitiveness (Torraco, 2011).

Historically, community colleges have been focused on providing access to as many people as possible (Cohen & Brawer, 2008; Dowd, 2007). The broad reach is intended to include students from a variety of backgrounds, diverse in age, racial identity, and socioeconomic status. Recruiting a wide range of students and having a demographically diverse student body has been the goal. Now that broad access has been improved, the focus has moved from increasing the number of students from underrepresented groups to promoting the success of those students. Both educational

research and institutional accountability measures are beginning to gauge how students with different levels of preparation, different demographics and different socioeconomic backgrounds achieve success once they are on campus. The goal has shifted, then, from providing equity of access to providing equity of outcomes (Dowd, 2007; Kezar, Glenn, Lester, & Nakamoto, 2008). Remediation is intended to equalize attainment, reducing disparities between the disadvantaged and advantaged (Bahr, 2008b).

There is a body of research identifying factors which predict whether a student will be required to remediate, and how they persist through the first year of college. There is also research available that discusses different approaches to mitigating the low completion rate for students in remediation. There is a deficit of information, however, that is specifically focused on the community colleges. There is also a lack of research on factors that affect the transition from pre-college into the first 15 credits of college-level coursework. Most studies do not acknowledge students who earn less than 10 credits at college level as intentional, and therefore focus primarily on persistence at the end of each full year (Calcagno et al., 2007). Because of this, those students that start in remedial coursework but do not fully make the transition into college are not evaluated in any of these analyses.

### **Purpose Statement**

The purpose of this study is to identify nonacademic factors that may influence the ability of underprepared, community college students to transition into college-level work. The quantitative study will examine the relationship between seven, independent factors and student persistence to transition, as measured by the students' completion of

15 college-level credits. The study will focus on students who begin college with a pre-college, or remedial math class in Washington State community colleges.

### **Conceptual Framework**

There are several theories of student departure, including Tinto (1975, 1987) and Bean (1980, 1985), examined below. Additionally, there are conceptual models that consider other factors that influence student persistence. This study is based on the concept that there are nonacademic factors that significantly influence persistence for students who begin at the community college in remedial coursework. The nonacademic factors studied are represented by seven variables identified in the literature review and available with the student data being analyzed. These factors may contribute to predicting the students' transition from remedial into college-level coursework, as evidenced by the completion of 15 college-level credits.

In 1975, Tinto developed a theory of student retention that established how individual and institutional interactions contribute to a student's decision to persist, or drop out of higher education. Tinto found that there were two primary influences on attrition: social integration and academic integration. The more integrated a student was into the college's academic and social environment, the more committed they were to the institution and the more likely they were to persist (1975). Consistent with Tinto's dimensions, Pascarella and Terenzini (1980) found that five factors (peer-group interactions, interactions with faculty, faculty concern for student development and teaching, academic and intellectual development and institutional/goal commitments) accounted for 44.45% of the variance in persistence.



Tinto later developed a Longitudinal Model of Institutional Departure (1987) that explored the same theory, this time evaluating it longitudinally over multiple semesters and years. This model examined the background characteristics that students bring with them to college, including financial factors (family social status), academic factors (high school performance) other, nonacademic factors (such as gender and race) and goal commitment. These background characteristics influenced how an individual student integrates with the institution's academic and social system (Pascarella & Terenzini, 1980).

Another relevant theory is Bean's Student Attrition Model (1980). Bean initially developed the theory based on models of organizational turnover as applied to higher education. As in a work organization, the intention to stay or leave was a predictor of persistence. Bean also identified external, attitudinal factors, such as family approval, financial attitudes, and encouragement from friends. His research showed that there were more complex external factors related to persistence (Cabrera, Castañeda, Nora, & Hengstler, 1992). In his 1985 model, Bean examined interaction affects based on exogeneous variables (academic factors, social-psychological factors and environmental factors), endogeneous variables (socialization selection factors such as grades and commitment) and their relationship to 'dropout syndrome' (1985).

Bean and Metzner's study of non-traditional student attrition (1985), however, resulted in a conceptual model reflecting the external environment that affected students in this group. The model focused on background and defining variables, including age, enrollment status, residence, educational goals, high school performance, ethnicity and gender. They also included other variables influencing steps in the process, including

academic variables (such as study habits) and environment variables (including employment and family responsibilities).

In 1992, Cabrera et al. did an extensive study that examined both Tinto and Bean's theories and how they converged to explain persistence for students in higher education. Their findings supported both models as appropriate methods for explaining attrition. The more complex, external factors identified in Bean's model were shown to influence the academic and social integration represented in Tinto's models. This pointed future researchers to include these factors in conceptual frameworks that consider influences on student attrition (Stewart, 2010).

More recent studies have examined the factors that may contribute to persistence. Several researchers looked at factors longitudinally, as Tinto eventually did, examining factors that affected students at the end of each year. The factors included academic, nonacademic and socialization variables (Bradburn, 2002; Dowd, 2007; Fike & Fike, 2008; Garcia, 2000; Ishitani, 2006; Johnson, 2006, 2008). Calcagno et al. (2007) and Hagedorn (2005) identified special issues for students 25 and older. Such 'nontraditional' students make up a significant portion of community college populations.

Looking specifically at students who come to college underprepared, as defined by requiring remediation, there is less research exploring these variables. Attewell et al. (2006) examined type of institution as a factor in placement. Large scale studies have examined factors that influence whether students either do not enroll in or do not complete the remedial courses they were assigned to take (Attewell et al., 2006; Bahr, 2010; Bailey et al., 2010). Attewell et al. (2006) and Bailey et al. (2010) also examined

how math assignment had significantly more impact on persistence than other remedial courses.

The foundational theories and conceptual models were developed with the assumption that students are traditional-aged, residential students at four-year colleges and universities. There is less research that specifically addresses the unique attributes of the contemporary community college student. None of the theories and concepts addresses the transition from pre-college to college-level coursework. Most of the attrition models do not even count students who do not complete the first semester. More research needs to be done to determine what factors predict whether underprepared community college students can make that critical transition into college-level coursework.

This study builds on past attrition research. It looks specifically at students who take a remedial math course at the community college, and evaluates variables that may influence their ability to transition into the first 15 credits of college-level courses. According to Calcagno et al. (2007), achieving the first 20 credits is an important milestone, and significantly predicts whether a student will go on to earn a certificate or degree. Because of the data available, this study focuses on the milestone of 15 college-level credits and evaluates the impact of seven nonacademic factors on underprepared, community college students' ability to achieve this. If factors can be identified that affect persistence, then interventions may be developed that will be effective to diminish attrition (Pascarella & Terenzini, 1980).

## Research Questions

The global research question is: Do any of the study's seven, nonacademic factors influence successful transition to college-level coursework for underprepared, community college students?

In order to test the seven independent variables, a series of null hypotheses were developed.

Null Hypothesis #1—Holding the other six factors constant, gender does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #2—Holding the other six factors constant, race/ethnicity does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #3—Holding the other six factors constant, age does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #4—Holding the other six factors constant, enrollment status (full-time or part-time), does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #5—Holding the other six factors constant, receipt of financial aid does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #6—Holding the other six factors constant, family status (single parent with dependents, couple with dependents, without dependents) does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #7—Holding the other six factors constant, purpose (workforce, transfer, or basic skills), does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

### **Assumptions**

The following assumptions apply to this study:

1. Three years represents reasonable time to transition from pre-college through the first 15 college-level credits.
2. Students who take at least one pre-college math course are representative of underprepared students.
3. All student demographic and profile data is self-reported. It is assumed that the students provided accurate information.
4. Nonacademic factors can significantly influence persistence.

### **Delimitations/Limitations**

The following delimitations/limitations apply to this study:

1. Data is only available on seven, nonacademic factors, as identified in research questions.
2. Ages are grouped together in decades, starting with 'under 20' and ending with '40 and above.' This may not match comparable studies.

3. Race/ethnicity reports only a single race and ethnic code.
4. Students are only tracked at a single college. If they move from one college to another, their progress is not noted in this data. Starting in 2012 students in the Washington State community and technical college system will receive a common id, but this was not available for past data.
5. Students may start one, two, three or four levels below college-level math. Because the level designation is not consistent across schools, the degree of students' math preparedness at any given level may not be consistent across schools.
6. Assignment to remediation varies among schools. Students whose scores qualify for college-level math at one school may not qualify, with the same scores, at another school. Washington State community and technical colleges are beginning to use reciprocal placement, but this was not available at the time this data was collected.
7. This data represents only community college students and only students at the 34 public community and technical colleges in Washington State.
8. All students identified as 'transfer' and 'basic skills' are included. Students who are identified as 'workforce' are included if they are coded as 'occupational preparation.'
9. Data does not measure people who re-enter college after the three year period.

**Definitions**

*Basic Skills:* Adult basic education courses below the high school level that develop skills in reading, writing, math and speaking/listening in English. Preparation for the GED is also included in this definition.

*Developmental coursework.* Remedial or pre-college coursework intended to prepare students for college-level coursework.

*Enrollment status.* Students are designated as full-time or part-time based on number of credits enrolled. Twelve credits or above is considered full-time. Students who are registered for less than 12 credits are considered part-time. Remedial coursework is included in the credit total for this designation. Basic skills classes are not.

*Family status.* Family characteristics as self-reported on student's application form. Students may identify single parent with children or other dependents, couple with children or other dependents, without children or other dependents, or other.

*Financial aid.* Students are identified as receiving financial aid if they receive federal, need-based financial aid in the form of a Pell Grant.

*Pre-college.* Coursework that is below the college level (remedial) and intended to prepare students for college-level coursework.

*Purpose.* Students self-identify purpose on application form, indicating workforce, transfer or basic skills as goal.

*Race/ethnicity.* Upon registration, students identify their race/ethnic categories. A student may choose more than one category. These records are then processed to create single codes for each student. If student has selected a single category, they are coded as chosen: Asian/Pacific Islander (including Hawaiian) only, non-Hispanic; African

American only, non-Hispanic; Native American (American Indian or Alaskan Native) only, non-Hispanic; Latino only; White only, non-Hispanic. If a student chooses more than one race, or selects ‘other race,’ they are identified as ‘Multiracial or other.’

*Remediation.* If a student applies to, or begins college, but has a skill deficit in math, writing or reading, that student is required to take ‘remedial’ coursework to remedy that deficit. These courses are generally credit-bearing, but are below the 100-level and do not count as credits toward certificates or degrees. Students are usually assigned to remedial, or pre-college, classes based on a placement test or high school transcript. In Washington State community colleges, schools use a variety of tests, including ACCUPLACER, ASSET and COMPASS. There is some variation in placement score requirements among colleges. In many cases, students are required to complete the assigned remedial coursework before enrolling in college-level classes. If students are assigned to remediation for math, they generally may take other college-level classes immediately, but may not take college-level math, science or some technical courses until they have completed the assigned remediation. Students may be required to take one, two, three or more remedial classes in a subject to get up to college level.

*Retention.* This generally describes ‘retaining’ students at the same institution until they complete a certificate or degree of 45 credits or more. Some studies referenced here use ‘retention’ to describe completion of a remedial sequence, or completion of a set period of time, like a year.

*Student Achievement Initiative.* A vehicle for performance funding in the community college system in Washington State, administered by the Washington State Board for Community and Technical Colleges. Colleges are incentivized for student



achievement, compared to previous years, in each of six different categories. The points are awarded for: basic skills test gains, passing a pre-college English or math class, completing 15 college-level credits, completing 30 college-level credits, completing a college-level quantitative skills class and completing a ‘tipping point’ degree or certificate worth 45 credits or more. Each measure, or ‘momentum point’ indicates a point that is shown to indicate milestones toward completing college in areas that can be influenced by the college (Prince, Seppanen, Stephens, & Stewart, 2010).

*Transition.* Students who start with a pre-college class and go on to complete 15 college-level credits have successfully transitioned from pre-college to college.

*Underprepared students.* Students who start college not academically prepared for college-level coursework, as measured by placement into required remedial or pre-college classes.

*Unduplicated headcount.* The students counted in the study are each identified once, no matter how many pre-college math classes, certificates or degrees they earn.

## **Significance**

This study is focused on a topic critical to colleges and universities around the country. It will add to research identifying factors that are related to successful transition to college for underprepared students. If it is determined that certain factors do influence success, those groups of students can be studied closer to determine how to bridge the gap for them. If interventions can improve a student’s likelihood to complete 15 college-level credits, it can help move them toward degree completion. This analysis will be critical to policy makers who are developing standards and incentives for colleges to move students farther and faster toward completion of degrees. It will also be important

for developing new programs focusing on students with specific factors that are most likely to relate to failure to persist. For faculty teaching new students, and especially students in pre-college courses, this research will increase their awareness of factors that influence successful transition.

## **Chapter 2**

### **Review of the Literature**

#### **Introduction**

This review of literature considers research related to persistence, remediation and strategies to address attrition for developmental students. The first section of the review introduces foundational theories of persistence and student development. It then evaluates research on persistence and, specifically, first year persistence. Several studies evaluated the demographics, preparedness and other factors for students who leave college after the first year, compared to those who retain into the second year and on to graduation in a four-year college. Studies also evaluated comparative levels of integration for students both on campus and in the classroom and how this influenced persistence. Since the unique demographics of community colleges are of special interest to this study, research on special issues of older students is addressed.

The next section takes a look at the number of students in remediation and how this has disparate impact on community colleges and their students. Research is reviewed that specifically addressed persistence in remedial courses and remedial sequences. Studies addressed the completion rate for remedial courses and, specifically remedial math courses. It reviews several analyses of the pre-college and demographic indicators that relate to completion statistics. The impact of being placed into remediation is reviewed, including comparative graduation rates of those who began in remedial classes. Studies also revealed how underprepared students who take remedial courses compared in college success to those who tested as being underprepared, but were not required to

take remediation. The dearth of research on students who fail to make the transition from pre-college studies in to their first 10-20 credits of college-level coursework is noted.

The remainder of the review considers interventions that have been studied to address completion of remedial coursework and persistence into college-level credits. Instructional approaches are reviewed here. There is significant research on contextualized learning for remedial curriculum, including new programs like I-BEST (Integrated Basic Skills and Education Training) in Washington State. Other models to contextualize curriculum include service-learning and cooperative learning in learning communities. Research regarding supplemental instruction and special concerns about measuring improvement with this model are introduced. Learning styles accommodation as a possible intervention is cited here. Other interventions are briefly noted here, including approaches to addressing deficits at the high school level, accelerating schedules and increasing the intensity of advising. Finally, research addressing the system-wide nature of required reforms is discussed and whole-system models are introduced. The chapter concludes with a synopsis of the research that has been reported on and provides an identification of the needs for additional study.

## **Persistence**

**Conceptual framework.** The conceptual framework of this study is drawn from past theories and models of student persistence. Research on higher education over the past 40 years has considered what positively influences persistence, and what contributes to attrition as students move from their freshman year through graduating with a four-year degree. Key theories described in this literature review have determined that both academic and nonacademic factors influence student persistence. Conceptual models,

also described in this review, build on those theories to look at specific factors that affect persistence, and specifically look at persistence in the first year. There are not yet conceptual models that explore the specific issues unique to community college students. Nor are there models that look specifically at underprepared students and their transition into college-level coursework. This study advances the concept that nonacademic factors identified in previous models may also have an influence for underprepared community college students as they transition into college-level coursework.

**Theories of persistence.** Two theoretical models have been primary in studying persistence and attrition in higher education: Tinto's Student Integration Model (1975, 1987) and Bean's Student Attrition Model (1980, 1985). Tinto's Integration Model examines the interaction between the student and the higher education institution, and how that relationship influences persistence. The model begins by looking at the factors that the student brings into freshman year: family background, individual attributes and pre-college schooling. These factors feed into the commitments the student makes to the institution and to his or her goals. The commitments, in turn, influence the factors that are keys to Tinto's model: academic integration, using indicators like grade performance, and social integration based on interactions with peer and faculty (1975). The integration influences commitment, which determines dropout decisions. Tinto's later work explored a longitudinal model, following dropout patterns through consecutive terms. That model included more specific background factors including financial factors (family social status), academic factors (high school performance) and nonacademic factors (such as gender and race) (1987).

Bean's model was founded on theories of organizational turnover which studied employee attrition in business organizations. Like Tinto's focus on commitment, Bean's model focuses on intent (1980). Bean also studied more closely both endogenous and exogenous variables that influenced a student's intent to persist in higher education. Both Tinto and Bean's theories, however, were developed using the traditional college student of that time period: full-time, 18-22 years old, residential students. Community college students today are likely to be part-time and older, and generally commute to campus (Cohen & Brawer, 2008). This creates a substantially different understanding of what 'integration' means and what factors may affect that.

In order to understand issues of success and retention, it is also important to review theory and research about student development. The student development theory considers seven vectors of development, including achieving competence and establishing identity. This theory posits that institutions of higher education need to address incoming students' academic deficits and also noncognitive or developmental deficits, including locus of control, attitudes toward learning, self concept, autonomy and ability to seek help. According to this theory, all of these factors influence success separately from students' intellect or academic skill (Higbee, Arendale, & Lundell, 2005). Considering this point of view broadens the college's charge, especially for underprepared students. In order to do well in the classroom, and then apply those skills as workers and citizens, students need to fill both academic and developmental gaps.

Transformative theories address students' reflective processes. Learning, in this context, considers what the students bring with them: knowledge, values, behaviors, and how they see themselves (Higbee et al., 2005). A small study of first-generation college

students at an Appalachian University identified additional factors that influenced success such as home and family culture and emotional support (Hand & Payne, 2008).

Considering all of these factors requires hearing the students' points of view on their attitudes, beliefs and self-perception. It also requires listening to students to identify issues that may create barriers or affect motivation. This includes differences among students, such as learning orientations or styles. Both student development and transformative theories require educators to apply a more holistic approach to helping students successfully transition into higher education.

**First year persistence.** Students who leave early in their college efforts are of special interest in this study. There are several research efforts that considered why students leave at each of the consecutive years. Public two-year college students were found to be more likely to leave the first year than four-year students (Bradburn, 2002). According to Fike and Fike (2008), predictors of retention for first year, community college students included financial aid, parents' education, the number of semester hours enrolled in and dropped during the first term and participation in student support services. A community college student's likelihood to transfer to a four-year institution was affected by socioeconomic status (SES). According to Dowd (2007) transfer to higher levels of education served middle income and high income students primarily.

Ishitani (2006) used event history modeling to evaluate four-year college students' attrition by year. First-generation students had a higher risk of leaving than students of college-educated parents during each of the four years. This had the biggest effect year two. Delaying the start of college, being female and being Hispanic all showed the highest risk of attrition in the second year. The most notable correlation for

dropping out in the first year was income. Students with the lowest family incomes were 2.3 times more likely to drop out in the first year than those in the highest family income group. Financial aid had a positive influence on retention in the first year. Those receiving either grants or work study were 37% and 41% less likely to leave that first year than students without aid. The study also showed that institutions that were not selective in admissions had significantly higher attrition rates, especially during year four and year one.

In a discrete-time approach analysis of stopping out by year, Iryna Johnson (2006) considered similar factors and their influence in attrition of 4-year college students. Those who stayed longer in their initial enrollment then stopped out were more likely to return than those who dropped out early. She found that students who matriculated directly from high school were less likely to leave, as were students who performed better in high school. Unlike Ishitani, Johnson (2006) found that first-generation students did not have higher odds of departure. Low income students were less likely to persist than students from higher income families. Part-time students were more likely to leave, especially in the initial semesters. High school percentile was positively associated with persistence. Caucasian and minority students were equally as likely to leave in the first semester according to this study. Johnson (2006) found that GPA had a significant influence on persistence in college-level coursework as well. "In most empirical studies, grade performance at the end of the first term has been shown to be the most important factor in college persistence and eventual degree attainment" (p. 927).

Johnson (2008) found that an increase of one point in GPA in the first semester improves the odds of persistence 3.1 times. She determined that the factor of GPA in



college decreased the influence of factors like high school performance. Bradburn (2002) agreed that lower academic performance increased attrition. Surprisingly, Bradburn found academic performance was more likely to be a deciding factor for full-time students and less likely for students who worked more hours during the first year. In general, nontraditional students and students with lower academic goals were less likely to leave because of grades. Bradburn also found that transfer between institutions and increase in the number of dependents increased departure and that students who worked full-time were more likely to leave.

**Special factors for older students.** Older students have special issues when it comes to persistence, and community colleges are more likely to have older students. In fall 2002, 35% of students (FTE) at 2-year public colleges were 25 and older, compared to 15% at four-year public colleges. Older students at the community colleges were less likely to earn a certificate or transfer after six years (60% compared to 40%) (Calcagno et al., 2007). Tracking more than 42,000 students in Florida's community colleges in 1998-1999, Calcagno et al. found that traditional-age students scored higher on math placement exams, but lower on verbal skills. The older students were more likely to have characteristics that affect persistence, like work, caregiving, engagement, part-time status and getting financial aid. In a survey of students, Hagedorn (2005) found that older students were more affected by time pressure and family responsibilities, less motivated by earning a degree and more motivated by finding or succeeding at a job. Hagedorn found that GPA, however, got higher as students get older, as did course completion.

## **Remediation**

**Remediation for students at the community college.** Many students come to American colleges and universities underprepared for college-level coursework. Based on entrance exams or high school grades, the college assigns specific ‘remedial’ courses the student needs to take. The topics generally include reading, writing and mathematics. The courses are in addition to the credits required for the student’s program of study. In many cases, students who test below a certain level are required to take assigned remedial courses as prerequisites for college-level courses. According to National Educational Longitudinal Study (NELS:88), which contains more than two million records, approximately 40% of traditional college students were required to take such courses. For older or nontraditional students, the rate was higher (Attewell et al., 2006).

Community colleges have traditionally had open-door, open access policies. They provide local, low-cost alternatives for universities. The demographics of a community college are more diverse and there is a wide range of academic preparedness. This student body is also more likely to need one or more pre-college-level classes in reading, writing or math. According to NELS:88 data, 58% of students enrolled at the community colleges took remedial coursework, compared to 26% of students at four-year colleges (Attewell et al., 2006). Within the community college, the number of students required to remediate is unevenly distributed demographically. In the state of Ohio, almost 60% of community college students that were traditional college age took at least one remedial math course. That was true for 62% of women and 54% of men. While 55% of White students in Ohio required remediation, a full 75% of Black and Hispanics did (Bettinger & Long, 2005).

In addition to attracting lower-prepared students, community colleges were more likely to place students in remediation. Again reviewing NELS:88 data, Attewell et al. (2006) examined 6,879 representative students as they moved from 8th grade through college. The authors controlled for a variety of background factors, such as race, socioeconomic status, academic preparation, high school skills tests and type of high school. They found that, after these controls, students in community colleges were still more likely to be enrolled in remedial courses (38%) than students who attended a four-year college or university (27%). They also found, after other factors were controlled, that Black students were more likely to take remedial courses. The analysis revealed, however, that a broad range of students required remedial coursework, representing a geographically diverse group that also included students from the highest quartile SES, students with the top percentage of high school skills tests and students with demanding academic coursework in high school (although all to a lesser extent). The data does not include students who need remediation, based on testing, but choose not to take it.

**Completion rate of remedial coursework.** Although a majority of community college students are unprepared for the academic requirements of college-level coursework, recent large-scale studies showed that most do not complete the required developmental education sequence (Attewell et al., 2006; Bailey et al., 2010). The studies showed that most of the students referred to developmental education classes in reading, writing or math either did not enroll in or did not complete the recommended sequence. As many as 30% of students who placed into remedial courses failed to enroll in any developmental education courses at all. Failure to enroll initially, or failure to enroll in

subsequent remedial classes led to more students not completing than either failing a class or withdrawing from a class (Bailey et al., 2010).

Significantly more students require remediation in math than any other subject (Adelman, 2004; Boylan & Saxon, 1999; Parsad & Lewis, 2003). In the Attewell et al. study (2006) the majority of students passed their developmental writing and developmental reading classes (68 and 71% respectively), while only 30% passed the remedial math courses. This can be compounded when students have more than one level of math to complete before college level. According to Bailey et al. (2010), only 10% of students who tested into the lowest level of math were able to complete a college-level math course, while less than 30% who tested into the highest level were able to complete the college-level course.

Both demographics and degree of remediation influenced the chances of a student successfully completing the recommended sequence of courses. Men, older students, African American students, part-time students and vocational students were all less likely to complete all of their remedial courses (Bailey et al., 2010). Bahr (2010) found that White students successfully completed their remediation in math at 3.1 times the success rate of Black students and 1.6 times that of Hispanic students. He also found that higher skill deficiency (more remediation required) had a strong relationship to the likelihood of remediating successfully. Half (50.3%) of students who entered at the highest level of pre-college math remediated successfully, compared to 6.9% who entered at the lowest level. The two factors compound when the data shows that 26% of White students entered at the highest level of remedial math, while only 11.5% of Black students and 15% of Hispanic students entered there. Only 17.4% of White students entered at the

lowest level, while 40.8% of Black students and 31% of Hispanic students did.

Additionally, grade performance in the first remedial math class had a significant effect and White students were more than two times as likely as Black students to earn an A in that first course.

**Success rates of students who require remediation.** Being assigned to remediation, combined with other factors, significantly diminished a student's chances of graduating (Calcagno et al., 2007). Only 25% of students who took a remedial course at a community college went on to earn a certificate or degree. Completing remedial math requirement, and then college-level math, creates a difficult barrier for students to pass on their way to completing their educational goals. In a study of 85,894 freshmen, Bahr (2008b) found that of the students who did not earn a degree or certificate and did not transfer, 84% of them were students who were referred to remedial math and did not complete their sequence. The more types of developmental needs a student had, the less likely the student was to be successful (Bahr, 2010; Bailey et al., 2010). Although Bahr (2007) found that math deficiency had an increasingly negative effect as the English skill level decreased, he did not find it to be substantive in relation to the significant barrier math deficiency alone had.

Although completing the remedial sequences is daunting for students, those who were successful had the same or better outcomes than students who went directly into college-level classes. Bettinger and Long (2005) compared students who took remedial math with students of similar cut-off scores who were at colleges that did not require them to take remedial math. Although the study was limited to those marginal students, it found that those placed in the remedial math were 15% more likely to transfer than

students with similar test scores and high school credentials who were not required to take remedial math.

Attewell et al. (2006) found that for community college students, those that completed remediation were more likely to graduate than students who did not take remedial courses, but were otherwise similar. For reading remediation, students were 11% more likely to earn a degree (associates or bachelor's) within eight years of high school, for writing remediation, 7% more likely. They concluded that the remedial courses did help the students who completed them. (This was not true, however, for students at the four-year colleges.) Bahr (2008b) found students who completed remedial math to have equal success in college attainment to those who were not required to take remedial math. Additionally, some research positively associated completion of a remedial class with second term retention (Calcagno et al., 2007). Bahr (2009) found that both single and dual skill remediation was successful in bringing students up to the level of students who did not require remediation.

**Factors affecting persistence for developmental students.** In her 2000 dissertation "The role of perceptions of remediation on the persistence of developmental students in higher education," Viola Garcia reviewed the predictive function of the Model of Student Adjustment (Nora & Cabrera, 1996). Garcia (2000) evaluated seven blocks of variables and came up with some surprising conclusions. She examined 339 students by matching survey data to students' reenrollment activity for the following term. She found Accuplacer reading scores were predictive of persistence, but not math or English scores. Unlike other studies, this research found that the more hours a student worked, the more

likely they were to persist. The factor was even bigger with on campus work, but off campus work also had a positive impact.

According to Garcia (2000), students who were socially more involved on campus, had positive academic experiences and used campus resources such as the library were all more likely to reenroll the following term. Perceived financial difficulty decreased persistence. Perceived feelings of discrimination and marginalization actually increased persistence. She found that the following factors did not have a significant influence: financial aid, time to completion, support from family and friends, classroom participation and informal interactions with faculty and goal commitments. The breadth of the analysis raised numerous questions that would be well served by further research.

For her dissertation, Sheilynda Stewart (2010) did an analysis of 3,213 freshman at the University of Oklahoma to determine factors that affected persistence. In addition to evaluating specific factors' influence on student retention, she measured to determine if the effects were different for students who placed in remedial classes than for students who did not place into remedial classes. According to the data, 60.5% of remedial-placed students persisted for five or more semesters compared to 73.2% of nonremedial students. The study found that, for both groups of students, there were statistically significant differences obtained for the effect of ethnicity, financial aid and remedial status on persistence. There were also significant relationships between high school GPA, first semester college cumulative GPA, ACT composite scores and persistence. Important to this review, however, is that Stewart did not find a difference in the effects on remedial and nonremedial students. Additionally, the sample was not directly applicable to the

community college population, since only 10.3% of the students in the study placed into remedial courses.

### **Transition from Pre-College to College-level Coursework**

Although there is a significant body of research and analysis about persistence, and statistics regarding factors that affect attrition after the first year, there is very little information about students who never get traction in college-level coursework.

Consistently throughout other studies published by the NCES, community college students who earned fewer than 10 college credits were removed from the samples analyzed (Adelman 1999, 2004, 2005, 2006). These students were called ‘incidental students’ and considered to be not committed to pursuing a postsecondary credential. (Calcagno et al., 2007, p. 778)

Adelman (2004) conducted a national analysis of the high school class of 1992. Eight and a half years after high school, one out of eight who attended some college quit before or at the 15 quarter credit mark. Calcagno et al. (2007) identified points of ‘academic momentum.’ If students reached these points, it increased their momentum and their chance of successfully completing a certificate or degree. They state that earning the first 20 college-level credits (excluding remedial courses) increased a traditional-aged student’s chance of graduating in any given quarter by a factor of 7.6. Combined with other milestones, this improved chances of graduation for all students.

### **Strategies for Improving Persistence for Students Requiring Remediation**

**Introduction to strategies.** A number of strategies have been developed and tested to increase persistence. In recent years, these strategies have been specifically applied to improve retention of students who begin college with required remedial coursework. Several of the strategies are based on contextualized learning. Service learning, developed within the framework of a course, is one approach. Learning



communities have been examined as a way to address both academic and developmental preparation. Supplemental instruction models have also been employed. Curriculum developed with attention to learning style preference is one method that has been implemented in a variety of course types. There are also noninstructional interventions such as advising that may mitigate the special issues remedial students face. Finally, many now believe that an entire, system-wide approach is required that may include a combination of these approaches.

**Contextualized learning.** Two models for developmental education are the prerequisite acquisition model and the concurrent acquisition model. Prerequisite acquisition is the typical ‘remedial’ class, in which students learn a specific academic skill in which they have a deficit, like writing, or math. Concurrent acquisition pairs the developmental (or remedial) skill building with a college-level course. This ‘concurrent’ model can be adjunct learning experiences, such as supplemental instruction or tutoring. Another concurrent model is coordinated studies or learning communities in which the developmental skill building is taught together with an academic or vocational college-level course (Higbee et al., 2005).

Contextualized learning is a concurrent model for building skills in which a class relates the subject being learned, such as math or writing, to subjects that are relevant to students (Baker, Hope, & Karandjeff, 2009). A standalone classroom can ‘contextualize’ basic skills by teaching them in relation to a theme or topic of interest to the student. An example is a writing class that is focused on the presidential election campaign. The basic skills content may also be infused into an academic or vocational program. An example is a horticulture class that teaches math for measurements and design. A more ambitious

implementation of contextualized learning is in courses that are linked together or connected in a coordinated study or learning community. A basic skills course, such as writing, may be paired with an academic or vocational class, so the basic skills concepts are taught together with the content for the college-level course.

One successful implementation of contextualized learning is the I-BEST (Integrated Basic Education and Skills Training) programs in Washington State. In the I-BEST classroom, two instructors work together: an ESL or ABE instructor and a vocational instructor. Students learn basic skills at the same time they are learning high-demand vocational skills (Hyslop, 2008). The program began in 2006. In 2009, 2,795 students were served in Washington's 34 community and technical colleges. The success is already measurable:

Students participating in I-BEST . . . were more likely to continue into credit-bearing coursework and to earn credits that count toward a college credential. They were more likely to persist into the second year, to earn educational awards, and to show point gains in basic skills testing. (Jenkins, Zeidenberg, & Kienzl, 2009, p. 26)

This program continues to grow. In 2010, Washington State began testing an I-BEST program in which basic skills are integrated with college-level, academic courses which will prepare students to transfer to a university.

**Service-learning.** Service-learning is another way to contextualize basic skills classes. Miami-Dade did a study in 2007 in which eight faculty members taught sections of College Preparatory Reading and College Preparatory Writing as well as a Student Life Skills course (Prentice, 2009). Each faculty member taught a pair of classes, one with service-learning, and one without. The college tracked data on demographics, pass rates, and retention as well as a pre- and postcourse survey of learning outcomes.

Unfortunately, out of the 400 participants, only 199 completed the postcourse survey, so that data has a smaller base. The results of the study were discouraging. For the service-learning student in the Student Life Skills courses, 23% received a D or an F, while in the nonservice-learning group, only 10% fell into this category. The Student Life Skills students in the service-learning group, however, reported gaining interpersonal skills in the survey. Also, although the statistics are not detailed, the study found that of students in the student life skills classes, those who had experienced service learning were more likely to persist in subsequent terms.

In the second group, the College Preparatory classes, 40% of the service-learning students received a D or an F, compared to 33% of nonservice-learning students (Prentice, 2009). In the postcourse survey, however, service learners scored higher on the Civic Responsibility. Course completion rates were lower for the service learning classes, but retention into the next two semesters was higher. The reason for failure in classes was not tracked, so it is possible that students' failure to complete the service-learning portion of the course was the reason for increased failure rate in the service-learning classes overall. The concept of service-learning contextualizing basic skills education is promising, but more research is needed to determine if the challenge of implementing service learning can be managed so that the net outcome is improved for developmental students.

**Cooperative learning in learning communities.** Different researchers describe cooperative learning and learning communities in a variety of ways. The most common definitions include situations in which two classes are taught together in a coordinated study. In these classroom environments, students and faculty spend an increased amount

of time together in integrated learning experiences. Elizabeth Wilmer (2009), writing about the benefits of learning communities for developmental education students, explores two different retention theories: Astin and Tinto.

Alexander Astin's theory focuses on student involvement, defined as:

The amount of physical and psychological energy that the student devotes to the academic experience. . . . He postulated that the amount that a student learns and develops as the result of an academic program is directly related to the quality and quantity of involvement that the student has invested in the program. (1984, p. 55)

Astin identified the critical forms of involvement as academic, student-faculty and peer. He identified student-faculty interactions as being the most critical to student satisfaction (Astin, 1984). One of the benefits of learning communities is that they fulfill all three of Astin's critical interactions. In the classroom 'community' of a coordinated study students have an opportunity to engage deeply with the academic material and build relationships with both their fellow students and their instructor.

Tinto's theory focuses on social and academic integration. The more integrated a student is to the college, the more committed that student is to persist and graduate (Tinto, 1975, 1987, 1993). The classroom becomes especially important in an environment like the community college in which many students do not spend time on campus except to attend classes. Tinto specifically highlighted cooperative learning as having a positive effect. His studies showed that being part of a learning community enhanced students' integration with the social system of peers and faculty as well as their academic integration with the program. This engagement led to better attendance and increased participation (Wilmer, 2009). Tinto found that cooperative learning in this type of environment increased student satisfaction and met the goals of increased grades and

retention. Because the students were more active participants in the learning process, they took more responsibility and had more commitment to their classmates.

New models of learning communities, like I-BEST, are being developed and implemented specifically for students placed into remediation. Especially important for underprepared students, learning communities have been shown to help students grow their identities as learners, including building academic self-confidence. They provide support and community for students who may not otherwise feel that they belong in a college environment (Engstrom & Tinto, 2008a, 2008b; Scrivener, Bloom, LeBlanc, Paxson, Rouse, & Sommo, 2008; Tinto, 1997; Tinto & Love, 1995). Recent studies show that learning community participation may increase retention. In a multi-campus, multi-year study that included colleges that serve low-income and first-generation students, learning community students had a higher rate of persistence than those who did not study in learning communities. For the four-year school studied, the persistence rates were 10% higher. The 2-year school persistence rates were 5% higher with learning community participation (Engstrom & Tinto 2008a, 2008b).

**Supplemental instruction.** One method for improving retention and success in developmental education courses is supplemental instruction. The goals for this effort are similar to any treatment: to decrease attrition, improve grades and increase retention to graduation (Phelps & Evans, 2006). One important aspect to supplemental instruction's approach is that it targets at-risk courses instead of at-risk students. These generally are courses that are 'historically difficult' and have a record of at least 30% of the students receiving poor marks of "D," "F," or "W." Supplemental instruction consists of creating group tutoring led by peer undergraduates who have attended the same courses. The

student leaders usually attend the class, take notes and read class materials. Then they conduct regular SI sessions. They are often trained in pedagogical theories and techniques. The supplemental instruction is designed to help students build skills in developmental areas, such as reading and study skills, as well as learn the content of the class. Because it is introduced at the beginning of the class, it is proactive, rather than waiting to address problems after they occur. Research has shown that students who participated in SI had significantly better GPAs. In addition, those participants persist at a higher rate, staying enrolled for additional terms.

The challenge to this research, however, is that the students who participated in SI were self-selecting. Those students were already ‘help-seeking’ and chose to attend the additional instruction sessions. It is logical to think that these same qualities of initiative and help-seeking would separate them from the control group in other ways that would have a positive impact on their performance and retention. This issue is exposed in a study at Valencia Community College in Orlando, Florida. For one group of students studied, there were classes where SI was optional, and a control group of classes in which SI was not available. The test section had a 52% completion rate for students who participated in SI and 35% for those who did not participate. The control group, however, had a completion rate of 54%, even higher than the group who chose to attend SI sessions. There were similar results in a study conducted on the smaller Valencia campus (Phelps & Evans, 2006). These findings, then, are inconclusive. They also do not address the question of motivation. What motivates some students to attend the extra study sessions? How are they different than students who choose not to attend?

The Community College of Baltimore introduced an SI type model called “Master Learners” in which a faculty or counselor fulfilled the same role as student leaders, as described above. These master learners conduct a weekly seminar for students. The Community College of Baltimore combines this Master Learner model with a learning community. The learning community contextualizes the developmental education classes by teaching them together with a general education course. This combination of supplemental instruction, learning community, and contextualized learning was cost-effective for the college because the investment was offset by increased retention (McPhail, McKusick, & Starr, 2006). In addition, the college believed that there was a professional development benefit for faculty members to have a better understanding of developmental learners, seeing them not as less capable, but having higher support needs.

**Learning styles accommodation.** A key to improving success for developmental education students may be to directly address each student’s preferred learning style in presenting the materials. Learning styles is the way students learn, how they take in, process and remember new material. According to Regina Rochford (2006), accommodation for learning styles preferences is more important for students with lower academic performance. Studies from as far back as the 1980s have shown that just making students aware of their preferred learning style improves their academic performance and increases rates of retention. Rochford cited six studies that demonstrated that academic achievement for students was significantly higher when study strategies aligned with students’ preferred styles. She also cited nine additional studies that showed that community college students, when taught difficult material using their strongest learning style preferences, increased their recall of the material significantly.

**Advising.** Several studies indicate that advising may have an impact on the success of developmental education students. A community college study by Geneva Escobedo (2007) in the Southwest indicated that there were benefits to intrusive advising. Even two hours per term for a test group of students increased retention. The program also provided orientations and communication between faculty and student retention specialists about students' progress. Bahr (2008a) also found advising to have a positive and statistically significant effect on successfully completing remediation for students requiring math remediation. It had a significantly greater effect on students who entered math at the lower three levels of pre-college than for those who entered just one level below college. Measuring advising's effect on successful transfer for students, he found that the benefit of advising was greater to students who needed remediation than those who did not.

**Additional interventions.** A comprehensive review of research on improving developmental education by MDRC (Rutschow & Schneider, 2011), covered four key areas of 'intervention.' In addition to contextualized learning and supports for students, discussed above, the report identified two other approaches. The first was addressing these issues while students are still at the high school level. In several models, students' skills were evaluated and deficits were addressed through support programs or summer bridge programs so that they were ready for college-level coursework by high school graduation. These have been shown to increase college readiness (Howell, Kurlaender, & Grodsky, 2010; Zuniga, 2008).

The other approach is identified by the report as 'acceleration models.' In one model, the length of the class can actually be condensed. This either shortens each



course, for example to a half semester, or shortens the sequences so students need to complete two terms, for example, instead of three. Courses may also be developed to be self-paced, or modularized, so students do one unique section at a time and pass set competencies before moving on to the next level. Finally, students may be ‘mainstreamed,’ or put directly in to college-level courses and then provided with additional support to manage the material. These models have been shown to increase pass rates of both pre-college and subsequent college-level courses and increase persistence (Adams, 2003; Adams, Miller, & Roberts, 2009; Bassett, 2009; Bragg, 2009; Brancard, Baker, & Jensen, 2006; Epper & Baker, 2009; Goen-Salter, 2008; Jenkins, 2009; Zachry & Schneider, 2008).

### **System-wide Models for Improving Persistence**

Most developmental education retention efforts have focused on ‘at risk’ students, or in some cases ‘at risk’ classes. Research confirms, however, that the factors that increase risk are present for a majority of community college students (Phelps & Evans, 2006). Because of this, many believe that any true change must happen at the organizational level. Kezar et al. (2008) conducted research that focused on organizational context and learning as the foundation for promoting equity and success. Their analysis focused on the way that organizations develop and change. The study concluded that deep ‘double-loop’ organizational learning is required in order for institutions to get to the root cause of inequitable outcomes. This puts the focus on the institution rather than focus on the characteristics of the students themselves.

Some colleges are creating whole systems of education and support that actually change the way the college works as an organizational system. An example of addressing

this as a comprehensive, college system is Hudson Valley Community College in New York. Hudson Valley Community College wanted to address the needs of students who were underprepared for college both academically and personally, but did not take advantage of specific, developmental courses or programs. Quirk (2005) describes how the college created a retention unit that assisted all students in the college as they developed the skills they needed to be successful in college and life.

This unit is called the Instructional Support Services and Retention, or ISSR. It includes testing, advising, academic placement, a centralized learning assistance center (LAC), open access student computer labs and other institutional efforts, including an early alert system, a first term 'freshman experience' course and volunteers on call for support. Combining all of these services under ISSR allowed departments, programs and services to work together as part of a student success team. "To use a medical metaphor, the LAC focused less on emergency room services for at-risk students and more on academic health maintenance programming, providing support services to all students from the beginning of their academic careers" (Quirk, 2005, p. 85).

Linking developmental education to this broader, organization-wide system for promoting student retention caused it to be integrated into the efforts to achieve Hudson Valley's mission of providing "dynamic, student-centered, comprehensive, and accessible educational opportunities that address the diverse needs of the community" (Quirk, 2005, p. 85). This movement has become institutionalized and integrated into campus-wide planning and evaluation. This allows the associate dean of ISSR to assemble resources to address issues such as services for students have not decided a major. It is integrated into the budget so the administrators of ISSR can assign resources,

both human and financial, to support these efforts across campus. Research needs to be conducted to determine if this systemic change impacted completion and persistence rates for developmental students.

An example of addressing this as an immense, system-wide change is the California Basic Skills Initiative. The California Basic Skills Initiative is an extensive, global approach to improving basic skills education in community colleges throughout the massive system that serves more than 2.6 million students. California found that a very high number of first time students (70-80%) needed developmental work, yet for students who enrolled in a basic skills class in 2001-2002, only 29% earned an associate's degree or a vocational degree or transferred to a four-year college by 2006-2007 (Illowsky, 2008). In order to address this systemically, California invested in a state-wide initiative to learn about the factors that enable students to be effective and implement the changes to increase retention and graduation.

The California Basic Skills Initiative had three phases. The first phase was a literature review. The research team did an extensive evaluation of effective practices at institutions throughout California and nationally. In order to be included in the review, programs needed to be able to show data that the effort had been successful. Effective practices were identified in 26 areas, which were grouped together in four categories: Organizational and administrative practices, program components, staff development and instructional practices. Upon completion of the review, the team developed a self-assessment that each college could use to evaluate the school's strengths and weaknesses in relation to the 26 areas identified (Illowsky, 2008).

In the second and third phases an immense, state-wide professional development program was implemented, followed by broadening state-wide professional development. The initial professional development effort directly addressed 1,600 community college personnel, and additionally presented papers to 1,500 professionals at conferences around the state. Follow-up professional development broadened into areas such as “equity and diversity challenges and strategies, high school to college transition, and . . . contextualized learning with basic skills embedded into occupational education courses and programs” (Illowsky, 2008, p. 89). Summer institutes focused on this training included 58,000 faculty members, more than half adjunct. The goal is to broadly implement best practices in developmental education at campuses and in classrooms around the state. Although this model was based on research, further studies need to determine if implementation had a significant effect on success for developmental students.

## **Conclusion**

Foundational theories of persistence and attrition establish that student persistence is influenced by multiple factors, both academic and nonacademic, that affect students’ commitment and intent. These factors, and students’ commitment, determines their ability to interact with the institution and academic programs, the key criteria for persistence. Student development and transformative theories establish that there are additional, developmental factors, like self concept, that influence students’ ability to learn.

It is important for colleges to focus on retaining students as they transition into college and the first year. Since community college students are even more likely to

dropout during the first year, identifying factors that influence or predict this behavior is critical. Studies reviewed here cited factors such as financial aid, full-time status and socioeconomic status as predicting persistence during that first year. GPA during that first term is generally accepted as a primary factor in dropout decisions. The impact of additional factors varied among the research efforts and was significantly altered when studies controlled for the other variables. Older students, more prevalent in community colleges, have special consideration in persistence studies. They are more likely to place into remedial math and more likely to have characteristics that influence persistence, like working, attending part-time, or receiving financial aid.

The majority of students starting at the community college are placed into remedial, pre-college-level classes. The most common area of remediation is in math. The enormous affect this has on persistence is evident in the statistics: As many as 30% of students with such placement don't even enroll. Of those that take remedial math, only 30% pass. Factors such as age, gender and especially race/ethnicity significantly influence a student's chances of completing required remediation. Grades and level of remediation also have a significant influence, which multiplies the completion gap among race/ethnicities.

Being assigned to remediation significantly decreases a student's chances of earning a certificate or degree. This is even more pronounced for students who need pre-college classes in math. Other studies show, however, that students that do successfully complete remediation go on to have equal or better success than students who started in college-level classes. Separate studies that researched factors that specifically affect students who start in remedial, or developmental classes, came to different conclusions.

One found Accuplacer reading scores, more work hours (the opposite of other studies in this review), and involvement on campus positively influenced reenrollment, while financial aid, social integration and goal commitments did not. The other study compared factors that influenced students placed into remedial classes with factors that influenced students not to be placed in remediation. She did not find that factors predicting persistence differed between the two groups. Although students placed in remediation were less likely to persist, the continuance of both groups was found to be related to ethnicity, financial aid, GPA, high school GPA and ACT scores.

None of the studies cited evaluated which factors influence students' ability to transition from remedial courses into college-level courses. Even though the first 20 college-level credits has been shown to be a critical momentum point, many studies drop students who earn less than 10 credits from their research, identifying them as 'incidental.' Knowing more about this transition is important to understanding remedial students. It is particularly critical for community colleges, who have both more remedial students and more students who drop out in the first year.

There have been waves of studies addressing specific strategies that colleges can take to improve the chances of success for remedial or developmental students. A good number of the strategies are academic, changing the configuration of the classroom or curriculum to better encourage mastery of these foundational skills. Contextualized learning has been shown to be particularly affective. This is especially true when basic skills classes are paired with vocational classes, as they are in Washington State's I-BEST (Integrated Basic Education and Skills Training) programs. Integrating basic skills with service learning has more mixed results.

Much research has been conducted about both cooperative learning and learning communities. This strategy directly addresses the persistence theories that identify social and academic integration as critical. In many cases, like the I-BEST model, it has been shown to increase completion and persistence, although the long term benefits of this strategy have not been shown. Supplemental Instruction has been shown to be effective. Because it is optional, though, the study subjects are self-selecting.

Nonacademic approaches have also been implemented. Advising has been shown to be effective with developmental education students. Working more closely with high schools is another approach. Some colleges are condensing, or accelerating remedial classes to shorten the commitment students have to make before they can take college-level courses. Several full-scale programs, like the California Basic Skills Initiative, see addressing this as a systemic problem that needs a college-wide or system-wide strategy to show significant improvement.

## **Chapter 3**

### **Research Methods**

#### **Introduction**

This study examined students who started at the community college underprepared, as evidenced by their need to take a remedial math course. Seven, nonacademic variables were analyzed to determine if they influenced a student's ability to transition from pre-college into college-level courses. Transition was determined successful if a student completed 15 college-level credits. Data was drawn from the 34 public community and technical colleges in Washington State. The data is collected by the Washington State Board for Community and Technical Colleges as part of the Student Achievement Initiative.

#### **Site Description**

The State Board for Community and Technical Colleges (SBCTC) coordinates Washington State's system of 34 public community and technical colleges. The SBCTC is "required to provide general supervision and control over the state system of community and technical colleges." Responsibilities of SBCTC include preparing operating and capital budgets and presenting them to the Legislature, disbursing capital and operating funds appropriated by the Legislature, guaranteeing that all colleges provide open access and provide programs specified by WAC., establishing standards for operations, including curriculum and degree requirements, and preparing master plans for the system. Additionally, SBCTC is charged to "encourage innovation, coordinate research, and disseminate research findings" (Washington State Board for Community and Technical Colleges (SBCTC)).



The SBCTC Annual 2010-11 Enrollment Report shows that during the year running from summer 2010 to spring 2011, the total full-time equivalent students (FTEs) for this system of 34 colleges was 161,081. Of that total, 55,591, or 35% were workforce, representing certificate and degree programs preparing students for professional and technical careers. An additional 68,195, or 42% were academic, preparing students to transfer to programs at four-year colleges and universities. The FTEs attributed to pre-college were 15,634, or 10% and the remaining 21,661 FTEs, or 13% were basic skills. The total headcount for the 34 colleges during 2010-2011 was 330,608 (Washington, 2011b).

Each of the community and technical colleges is unique in the demographic of students it serves, the community where it is located, the types of programs offered and employers in the region. To provide an example of this diversity, following is a brief description of four of the schools. A complete description of colleges' populations is found in Table 1.

**Clover Park Technical College** is located near Tacoma, the state's second-largest city and near McChord Air Force Base and Fort Lewis. CPTC offers 50 programs ranging from allied health to manufacturing (Clover Park Technical College, n.d.). In 2010-2011, CPTC had 5,562 FTEs, 75% of which were workforce (WSBCTC, 2011b).

**Everett Community College** is in Everett, Washington, population 103,100, which is the county seat of Snohomish County, Wash. Major employers include the Boeing Company (City of Everett, Washington, n.d.). Everett Community College offers several associate's degrees intended to transfer, as well as certificate programs in 30

Table 1

*FTES by Purpose for Attending by College State Supported Academic Year 2010-211*

	Workforce Education	% of Total	Transfer	% of Total	Basic Skills as Immediate Goal	% of Total	Home & Family Life/ Other/Not Specified	% of Total	Total
Bates	3,387	80.5%	19	0.4%	310	7.4%	493	11.7%	4,209
Bellevue	3,399	34.1%	5,453	54.6%	480	4.8%	648	6.5%	9,980
Bellingham	2,288	93.8%	14	0.6%	85	3.5%	52	2.1%	2,440
Big Bend	1,043	55.3%	678	35.9%	154	8.2%	12	0.6%	1,887
Cascadia	325	15.5%	1,548	74.0%	196	9.4%	22	1.1%	2,091
Centralia	1,079	40.9%	873	33.1%	456	17.3%	233	8.8%	2,641
Clark	4,228	43.1%	4,434	45.2%	945	9.6%	213	2.2%	9,819
Clover Park	4,806	86.4%	55	1.0%	310	5.6%	392	7.0%	5,562
Columbia Basin	2,112	41.6%	2,431	47.8%	498	9.8%	42	0.8%	5,084
Edmonds	2,790	43.3%	2,935	45.6%	513	8.0%	202	3.1%	6,439
Everett	2,364	43.1%	2,324	42.4%	735	13.4%	56	1.0%	5,479
Grays Harbor	964	49.3%	633	32.4%	264	13.5%	94	4.8%	1,954
Green River	2,583	38.7%	3,038	45.5%	960	14.4%	94	1.4%	6,675
Highline	2,091	30.2%	2,636	38.1%	2,116	30.5%	85	1.2%	6,927
Lake Washington	3,112	83.1%	349	9.3%	157	4.2%	130	3.5%	3,747
Lower Columbia	1,869	51.2%	1,115	30.5%	588	16.1%	79	2.2%	3,652
Olympic	3,035	50.3%	2,528	41.9%	324	5.4%	145	2.4%	6,031
Peninsula	948	47.1%	817	40.6%	182	9.0%	65	3.2%	2,012
Pierce Fort Steilacoom	1,785	47.2%	1,925	50.9%	33	0.9%	41	1.1%	3,783
Pierce Puyallup	1,045	42.4%	1,241	50.3%	158	6.4%	21	0.9%	2,464

Table 1 continues

	Workforce Education	% of Total	Transfer	% of Total	Basic Skills as Immediate Goal	% of Total	Home & Family Life/ Other/Not Specified	% of Total	Total
Renton	3,014	74.3%	218	5.4%	722	17.8%	101	2.5%	4,054
Seattle Central	2,618	44.7%	2,445	41.8%	589	10.1%	201	3.4%	5,852
Seattle North	2,014	46.1%	1,806	41.3%	377	8.6%	174	4.0%	4,371
Seattle South	2,298	48.5%	1,320	27.9%	1,046	22.1%	72	1.5%	4,735
Seattle Voc Institute	519	74.2%	2	0.3%	178	25.5%	0	0.0%	700
Shoreline	2,099	40.5%	2,232	43.1%	389	7.5%	461	8.9%	5,182
Skagit Valley	2,404	55.6%	1,627	37.7%	203	4.7%	88	2.0%	4,322
South Puget Sound	1,822	41.7%	2,201	50.3%	192	4.4%	158	3.6%	4,373
Spokane	4,770	72.9%	1,642	25.1%	11	0.2%	122	1.9%	6,546
Spokane Falls	1,378	28.2%	3,375	69.0%	23	0.5%	117	2.4%	4,893
Spokane IEL	1,352	41.1%	515	15.6%	1,158	35.2%	269	8.2%	3,293
Tacoma	2,287	38.2%	3,302	55.1%	335	5.6%	67	1.1%	5,990
Walla Walla	1,972	57.3%	1,139	33.1%	239	6.9%	92	2.7%	3,443
Wenatchee Valley	1,266	43.5%	1,406	48.4%	226	7.8%	10	0.3%	2,908
Whatcom	1,056	33.8%	1,897	60.7%	125	4.0%	45	1.5%	3,124
Yakima Valley	1,947	44.1%	1,509	34.2%	876	19.8%	85	1.9%	4,417
SYSTEM TOTAL	78,069	48.5%	61,682	38.3%	16,148	10.0%	5,182	3.2%	161,081

Source: SBCTC Data Warehouse, Stuclass and Student Tables.  
AYR 2010-11 Washington Community and Technical Colleges (WSBCTC 2011a)

technical and career fields (Everett Community College). In 2010-2011, Everett Community College had 5,480 FTEs, 45% academic, for students intending to transfer to a four-year college or university (WSBCTC, 2011b).

**Lower Columbia Community College** is in Longview, Washington, a rural community with a population of 35,000. Major employers include Weyerhaeuser (City of Longview, Washington, n.d.). LCC offers academic programs leading to transfer, plus 10 professional and technical programs (Lower Columbia Community College, n.d.). In 2010, 2011, Lower Columbia Community College had 3,651 FTEs, with the biggest portion, 39%, being academic transfer. A large number, 21%, were basic skills students (WSBCTC, 2011b).

**North Seattle Community College** is one of three community colleges that are part of the Seattle District located in Seattle, Washington, population 602,000 (City of Seattle Department of Planning and Development, 2011). Major areas of employment include information technology, tourism and aerospace. Employers include Boeing, Microsoft, University of Washington, Amazon and Weyerhaeuser (City of Seattle, n.d.). North Seattle Community College prepares students to transfer to four-year colleges and universities and is one of the top colleges in the number of students who transfer to the University of Washington. The college also has 50 certificate programs in a variety of professional and technical fields (North Seattle Community College, n.d.). The annual enrollment report does not break out the separate schools in the Seattle District, but a separate report, the 2010-2011 academic year report shows North Seattle's state-supported FTEs to total 4,371 (WSBCTC, 2011a). North Seattle's own website lists their

fall 2010 students enrolled as 41% academic transfer, 42% professional/technical (workforce) and 16% developmental (North Seattle Community College, n.d.).

### **Research Design**

The primary purpose of this analysis was predictive, to establish the relationship between the seven independent variables and the dependent variable: student's successful transition to college-level coursework. "If two variables are known to be related in some systematic way, it is possible to use one of the variables to make accurate predictions about the other" (Gravetter & Wallnau, 2009, p. 524). The resulting relationships show if any of the nonacademic variables can predict whether an underprepared student will successfully transition into college-level coursework. These relationships can also be used for theory verification (Gravetter & Wallnau, 2009).

Logistic regression was selected as the best method to analyze these relationships. In education, the multiplicity of research factors complicates statistical analysis. What is even more important to consider in choice of analysis is the effect of the relationships among all of the factors (Cohen, Cohen, West, & Aiken, 2003). In addition to the variety of factors, many variables in education are dichotomous categories rather than interval numbers. Because of such considerations, logistic regression analysis has been used in education for decades (Cabrera, 1994). This type of analysis allows the researcher to evaluate each categorical variable, while controlling for all of the other variables in the set.

Logit analysis provides a global test for the significance of a predictor controlling for all other predictors in the model, as well as a test for the significance of a set of predictors. The impact of a given predictor on the dependent variable, adjusted for other effects in the model, is summarized by parameters that translate into odds ratios. (Berge & Hendel, 2003, p. 4)

Logistic regression, as opposed to multiple, stepwise regression was used because the data was identified in categories (like male or female), rather than continuous variables (numeric). The outcome variable was also a categorical variable, whether students do or do not complete 15 college-level credits. Like stepwise regression, ANOVAs are also appropriate only for continuous, numeric variables and criterion. Additionally, ANOVAs do not control for the effects of multiple factors. Goodness of fit tests are not appropriate because they do not account for two variables that may move together and predict the same outcome repetitively. Logistic regression accounts for any overlap and separates out the effect of each variable.

The study was nonexperimental and examined the data *ex post facto*. All of the data analyzed pre-existed in the data warehouse at the Washington State Board for Community and Technical Colleges. The “variables are simply observed as they exist naturally in the environment—there is no attempt to control or manipulate the variables” (Gravetter & Wallnau, 2009, p. 520). The variables were all fixed and were not manipulated or changed during the course of this research.

### **Data Collection**

This research studied students in Washington State’s 34 public community and technical colleges who took pre-college classes in math. The goal was to track those students through their pre-college classes into college-level classes. The data was collected for a program called the Student Achievement Initiative. The same data was collected from each of the colleges, over the school years 2006-2007, 2007-2008 and 2008-2009, 2009-2010 and 2010-2011. Data for each school year begins with the summer quarter and ends in the spring quarter.

The Student Achievement Initiative is a vehicle for performance funding in Washington State. The plan was initiated in 2006 and the first year performance was funded was 2008-2009. Colleges are rewarded for their achievement, compared to previous years, in each of six different categories. Each of these categories, or ‘momentum points,’ measures a critical step in a student’s progress. The points are awarded for: basic skills test gains, passing a pre-college English or math class, completing 15 college-level credits, completing 30 college-level credits, completing a quantitative skills class and completing a ‘tipping point’ degree or certificate worth 45 credits or more. Each measure, or ‘momentum point’ indicates a point that is shown to indicate milestones toward completing college in areas that can be influenced by the college (Prince et al., 2010). Each milestone is recorded for each student along with their demographic data. Since all 34 colleges are tracking each measure for each student starting in 2006, there is a vast amount of data that enables analysis of the entire system.

Longitudinal data was analyzed using data previously collected by the SBCTC. Each of the 34 schools collects enrollment data for each student. Demographic information in these records has been provided by the student. Each school submits both enrollment data and transcript data to the State Board for Community and Technical Colleges every quarter. This submission happens through a secure transfer. The data is stored in a data warehouse. The SBCTC processes the data and assigns momentum points for each student and college. Annual denotations include records beginning in summer and ending with spring quarter. For example, 2010-2011 data includes records for four quarters: summer quarter 2010, fall quarter 2010, winter quarter 2011 and spring quarter 2011. Data pulled for this research project was all student-level data, with no

aggregation. Each record was given a system id. The student identification and social security numbers were not provided, so researcher had no ability to identify any of the subjects. Records included all students enrolled on the tenth day of the quarter. Students who withdrew before that date were not included in this data. Permission to use data is found in Appendix A.

### **Institutional Review Board**

Prior to commencing this research, the researcher obtained approval from the University of Nebraska, Lincoln Institutional Review Board. Exempt review was requested. The proposed exempt research proposal was reviewed by the IRB staff, in consultation with the IRB Chair or HRPP Director, and it was determined that the research met at least one of the categories of exemption from federal regulations for protection of human research participants in accordance with Health and Human Services regulations at 45 CFR §46.101(b).

This research met the qualifications of exempt review because the data being used already existed. The information was recorded in a way that the investigator was not able to identify the participants, either directly or through identifiers. Each student record was assigned an identification number in the data warehouse at the Washington State Board for Community and Technical Colleges. The researcher did not have access to student names, student identification numbers or student social security numbers. All of the data existed prior to the start of the research.

### **Review of Related Literature**

A review of literature was conducted to provide a perspective of theories and concepts related to factors that influence or predict persistence. There are theories and



concepts related to persistence that include student integration academically and socially at college (Tinto, 1975, 1987) and additional factors that may influence that integration (Bean, 1980, 1985). Additionally, studies consistently show that academic performance in the first term greatly affects persistence (Bradburn, 2002; Johnson, 2006, 2008; Stewart, 2010). This study is focused on the nonacademic factors that may influence both integration and academic success. Recent studies have concluded that nonacademic variables had an influence on persistence, especially persistence in the first year.

Nonacademic variables identified as being a factor include race/ethnicity (Bailey et al., 2010; Ishitani, 2006), gender (Bailey et al., 2010), age (Bailey et al., 2010; Calcagno et al., 2007), full-time or part-time enrollment (Bailey et al.; Fike & Fike, 2008; Johnson 2006), socioeconomic status (Fike & Fike, 2008; Garcia, 2000; Ishitani, 2006; Johnson 2006), financial aid (Fike & Fike, 2008; Ishitani, 2006; Stewart, 2010), parent's education (Fike & Fike, 2008; Ishitani, 2006). Studies do not exist, however, that relate these factors to transition into college-level coursework.

This study, then, evaluated whether nonacademic factors influenced the ability of underprepared community college students to transition into pre-college work, as evidenced by the completion of 15 college-level credits. Nonacademic factors considered were race/ethnicity, gender, age, part-time or full-time status, and financial aid. Additionally, this study evaluated family status (students single with dependents, couple with dependents, or without dependents) and purpose for going to school (workforce, transfer, or basic skills) since this information is specifically relevant for community college students (Cohen & Brawer, 2008). The data available for socioeconomic status is tied to zip codes analyzed for the 2000 census. This data was not created for the 2010

census. The age of the data and changes in zoning makes this variable unreliable and therefore was not considered in this analysis. The data for parent's education was not available for these students.

### **Study Variables**

The dependent variable used for this study was transition to college, as measured by achievement of 15 college-level credits. The records obtained by the researcher had already analyzed transcript records for students who begin in pre-college math in Washington State public community colleges and denoted whether each student did, or did not complete 15 college-level credits.

**Age group.** The first independent variable is age group. The age for each student is calculated on the first day of each quarter. The ages are then categorized into primary groups. Students under 20 are coded as '1,' 20-29 coded as '2,' 30-39 coded as '3,' and 40 and up coded as '4.'

**Financial aid.** The second independent variable measures whether a student is economically disadvantaged based on their receipt of federal, need-based financial aid in the form of a Pell Grant. This is updated quarterly at the colleges from their Customer Accounts databases, where aid is reflected. It may also be manually updated at the college. For this analysis, this indicator was identified in the first quarter the student was enrolled during that year. Students coded y receive financial aid; students coded n do not receive financial aid.

**Family status.** The third independent variable is family status. This is identified by the student at the time of admission. Students and colleges have the ability to update this data, although this is unusual. Students who identify as single parents with children

or other dependents are coded as 11. Students who identify as couple with children or other dependents are coded as 12. Students who identify as being without children or other dependents are coded as 13.

**Enrollment status.** The fourth independent variable is enrollment status. This is calculated in the last quarter the student attended in that year. Students who take less than 12 credits (including remedial courses) are coded PT. Students who take 12 or more credits are coded FT.

**Gender.** The fifth independent variable is gender. Students who identify as male are coded 'm.' Students who identify as female are coded 'f.'

**Purpose.** The sixth independent variable is 'kind' of student, which reflects purpose for attending. This is based on a field that is entered at the time of admission, but may be updated. In some colleges, students select their intent. At some colleges, it is selected for them based on their program. Students in workforce programs, working toward professional or technical certificates or degrees are coded 'w.' Students in academic programs intended to transfer to a four-year college or university are coded 't.' Students who attend the college for the purpose of basic skills are coded 'b.'

**Race/Ethnicity.** The seventh independent variable is race/ethnicity. Upon registration, students identify their race/ethnic categories. They may choose more than one category. These records are then processed to create single codes for each student. If student has selected Asian/Pacific Islander (including Hawaiian) only, non-Hispanic, they are coded 1. If a student selects African American only, non-Hispanic, they are coded a 2. If a student selects Native American (American Indian or Alaskan Native) only, non-Hispanic, they are coded a 3. If a student choose Latino only, they are coded a 4. If a

student chooses more than one race, or selects ‘other race,’ they are coded a 5. If a student selects White only, non-Hispanic, they are coded a 6. (Data does not contain international students.)

### **Research Questions**

The global research question is: Do any of the study’s seven, nonacademic factors influence successful transition to college-level coursework for underprepared, community college students?

In order to test the seven independent variables, a series of null hypotheses were developed.

Null Hypothesis #1—Holding the other six factors constant, gender does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #2—Holding the other six factors constant, race/ethnicity does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #3—Holding the other six factors constant, age does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #4—Holding the other six factors constant, enrollment status (full-time or part-time), does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #5—Holding the other six factors constant, receipt of financial aid does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #6—Holding the other six factors constant, family status (single parent with dependents, couple with dependents, without dependents) does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

Null Hypothesis #7—Holding the other six factors constant, purpose (workforce, transfer, or basic skills), does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

### **Population**

The data was selected from all 34 public community and technical colleges in Washington State. Students evaluated in this analysis were all students who began during the 2008/2009 school year with no prior college at that institution and who took a pre-college math class during that first year. Students who identified their purpose as workforce (except those with the intent code “vocational preparatory applicant”), transfer or basic skills were included. International students were excluded, as were students who identified their purpose “other personal goal or reason.” Each record contained a unique student, so the data represented unduplicated headcount. The records were processed on the tenth day of the quarter, so students who withdrew before the tenth day of the quarter were not included in this data. The method for placing people into pre-college math classes and assigning them levels varies among the 34 colleges. Most schools require a

placement test when students enroll, such as the ACCUPLACER, ASSET and COMPASS. The scores on the test that place students into remediation, and degree of remediation, vary among schools, so a student could require remediation at one school, but not necessarily at another. The data analyzed included:

- individual students included in the data: 23,481; and
- usable data after incomplete records were excepted: 15,177.

Specific descriptive statistics are presented in Chapter 4.

### **Data Analysis**

The data was analyzed using logistic regression. The data was loaded into ACCESS, where student groups were selected and then exported into Excel. Those files were imported into SAS statistical software to evaluate. All seven independent, predictor variables were evaluated together with criterion, dependent variable.

The regression provided an overall test of the seven indicators in combination to determine if the effect of the entire group of factors was significant, and to identify if at least one of the predictors was significant. Additionally, the test provided information for each separate variable, determining the odds ratio for each category of a variable being present when the outcome was persistence. Each individual test held the other six independent variables constant, to determine if it had a significant impact separately from the other variables. This signified the level to which each of the independent variables can predict the dependent variable. It determined the regression coefficient for each variable in relation to the two, possible outcomes (students persist, or do not persist to transition). A level of significance of .05 was be used.

## **Chapter 4**

### **Results and Data Analysis**

#### **Introduction**

The data was analyzed using logistic regression with the SAS computer software. The model uses the binary logit method to analyze each factor compared to a referent. The optimization technique is Fisher's scoring, which is used to estimate the regression parameters (UCLA: Academic Technology Services, Statistical Consulting Group). Full details of that report are in Appendix B. A total number of 23,481 observations was read. The number of observations used was 15,177. The other 8,304 observations were not used because the data was incomplete. Descriptive statistics for the 15,177 records in the sample are shown in the first column in Table 2.

The large number of records lost (35%) raises concern that the final sample analyzed is, in fact, representative. Most of the lost observations were because of missing or inadequate information in the family status field. The possible codes for family status were 11, single parent with children or other dependents, 12, couple with children or other dependents, 13, without children or other dependents and 90, other. Since 90 does not designate meaning (either people have dependents or not), all records with family status coded 90, or with family status missing, were dropped from the analysis. To demonstrate how the final sample compares with the overall population, descriptive statistics are also provided for all students who took pre-college math during the 2008-2009 school year. As indicated in Table 2, the percentages in the sample of the study and the population are very close. They are all within two percentage points, with the

Table 2

*Frequencies of Categories by Percentage*

	Sample	All Pre-college Math Students
Gender		
Female	52.36	53
Male	47.64	47
Race/Ethnicity		
Asian/Pacific Islander	6.62	6
African American	6.34	6
Native American	1.69	2
Latino	10.96	10
Multiracial/other	6.03	6
White	68.35	66
Age		
Under 20	47.68	44
20-29	34.86	38
30-39	10.38	11
40 plus	7.08	7
Enrollment Status		
Full-time	66.04	61
Part-time	33.96	39
Financial Aid		
Received	32.12	n/a
Did not receive	67.88	n/a
Family Status		
Single w/Dependents	11.64	n/a
Couple w/Dependents	14.49	n/a
No Dependents	73.87	n/a
Purpose		
Basic Skills	3.76	3
Transfer	74.47	73
Workforce	21.76	23



exception of the 20-29 year olds (three percentage points moved from the under 20 to the 20-29 year old groups) and the enrollment status (population shows five percentage points more part-time students). Based upon these comparisons, the final sample appears to be representative of the population.

The dependent variable analyzed in this study is whether or not underprepared college students, who begin college for the first time with a developmental math class in 2008, achieve 15 college-level credits by the end of the 2010-2011 school year. “For a dichotomous dependent variable  $Y$ , we consider the score for one individual to be  $Y = 1$  if a person exhibits a particular characteristic,  $Y = 0$ , otherwise; that is, we use 1 and 0 for case versus noncase, respectively” (Cohen et al., 2003, p. 481). A student who successfully completes is a case, a student that does not is a noncase. Of the 15,177 observations used, the frequency distribution showed that 10,782 (71%), did complete the 15 college-level credits (case) and 4,395 (29%) did not (noncase).

The alpha level for this analysis is .05. This means that if  $p \leq .05$ , the results are considered significant. Three chi-square tests were used to test the global null hypothesis that at least one of the predictors' regression coefficients is not equal to zero. These tests show whether at least one of the independent factors is able to predict completion of the 15 college-level credits. With degrees of freedom = 15 for the global test, all three chi-square tests: Likelihood Ratio, Score and Wald, showed that at least one independent factor helped predict the outcome. In each test  $p < .0001$ , so the results are significant (see Appendix B for full results).

The logistic regression analysis of specific, independent variables compares each variable to a referent. Male, for example, is the referent and female is compared to male.

The results of the comparisons are shown in Table 3. The degrees of freedom (df) for each measure in the individual tests is 1, since each test is binary, comparing a single factor with its referent. The Analysis of Maximum Likelihood Estimates, the beta weight or estimate “indicates the direction of the effect that a particular independent variable has on the dependent variable. In the case of categorical variables, the interpretation of the coefficients is a function of the excluded category” (Cabrera, 1994, p. 245). This means, if a result is statistically significant (asterisks indicate significant findings), a positive estimate shows that group is *more* likely than the referent group to successfully complete 15 college-level credits and a negative estimate shows that group is *less* likely than the referent group to successfully complete 15 college-level credits.

The standard error reflects the standard errors of the individual regression coefficients. The Wald chi-square test statistics are compared to an alpha level of .05. This means any test with  $p \leq .05$  is considered significantly different than the referent . The odds ratio estimates show the effect size.

In the logistic regression model, the predicted score is not itself dichotomous; we are not predicting whether someone is a case versus a noncase. Rather we are predicting a value on an *underlying variable* that we associate with each individual, the *probability of membership* in the case group. (Cohen et al., 2003, p. 483)

Since the odds ratios “provide an indication of the strength of the effect of the [independent] variables. . . . The effect is positive if  $> 1$ , negative if  $< 1$  and no differential effect if  $= 1$ ” (Berge & Hendel, 2003, p. 8). An odds ratio of 2, for example, would show that the odds are two times higher than the referent for that grouping. An odds ratio of .75 would show that the odds are .75 times the odds of the referent that a student would be a ‘case.’

Table 3

*Logistic Regression Analysis*

	Analysis of Maximum Likelihood Estimates				Odds Ratio Estimates
	DF	Estimate	Standard Error	Pr>ChiSq	Point Estimate
Gender: Compared to Male					
Female*	1	0.2265	0.0386	<.0001	1.254
Race/Ethnicity: Compared to White					
Asian/Pacific Islander	1	0.111	0.0784	0.1564	1.117
African American*	1	-0.395	0.0752	<.0001	0.674
Native American*	1	-0.5688	0.1381	<.0001	0.566
Latino*	1	-0.206	0.0606	0.0007	0.814
Multiracial/other	1	0.013	0.0813	0.873	1.013
Age: Compared to Under 20					
20-29*	1	-0.1062	0.0434	0.0144	0.899
30-39	1	0.1231	0.0721	0.0878	1.131
40 plus*	1	0.1757	0.0843	0.0371	1.192
Enrollment Status: Compared to FT					
Part-time*	1	-1.2861	0.0395	<.0001	0.276
Financial Aid: Compared to No Aid					
Received Aid*	1	0.2093	0.0455	<.0001	1.233
Family Status: Compared to No Dep.					
Single w/Dependents*	1	-0.2631	0.0652	<.0001	0.769
Couple w/Dependents	1	0.1032	0.0595	0.0826	1.109
Purpose: Compared to Transfer					
Basic Skills*	1	-0.6335	0.0919	<.0001	0.531
Workforce*	1	0.1259	0.0497	0.0113	1.134

\*Denotes significant results

## Results of the Research Questions

**Research question 1: Gender.** The first research question tests the null hypothesis: holding the other six factors constant, gender does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. For the logistic regression analysis, ‘male’ was coded as zero, the referent. ‘Female’ was coded as one. The resulting analysis, therefore, compares the outcomes for females compared to the referent males. The estimate for female is .2265, showing a positive relationship between being female and successfully completing 15 college-level credits. The standard error is .0386. The Wald chi-square test shows  $p < .0001$ , indicating that the relationship is significant. The 95% Wald Confidence Limits confirms a significant effect. The odds ratio estimates show the point estimate as 1.254, reflecting the size of the effect. The odds of the group coded as a 1 (female) successfully completing 15 college-level credits are 1.254 times the estimated odds for the reference group (i.e. the group coded as a zero, males) when the other six predictors are held constant. The null hypothesis, then, is rejected. Holding the other six factors constant, gender does have a significant effect on completion of 15 college-level credits.

**Research question 2: Race/Ethnicity.** The second research question tests the null hypothesis: holding the other six factors constant, race/ethnicity does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. Since “the categorical independent variable under consideration is made up of more than two categories, new variables need to be created to represent the categories” (Cabrera, 1994, p. 233). This sets up five comparisons of race/ethnicity. White is 0, the referent, and is compared to each of the other five

race/ethnicities separately. White is compared to Asian/Pacific Islander, White is compared to African American, White is compared to Native American, White is compared to Latino and White is compared to Multiracial or other race. Each comparison is analyzed and the effect and significance measured.

The first race/ethnicity comparison, then, tests the null hypothesis: holding the other six factors constant, being Asian/Pacific Islander does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. The Wald chi-square test shows that the probability that this has an effect is  $p = .1564$ . Since this does not meet the .05 test of significance, the effect is non-significant. The 95% Wald Confidence Limits also shows the relationship to be non-significant. The null hypothesis cannot be rejected: Holding the other six factors constant, being Asian/Pacific Islander does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

The second race/ethnicity comparison tests the null hypothesis: holding the other six factors constant, being African American does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. For the logistic regression analysis, 'White' was coded as zero, the referent. 'African American' was coded as 1. The resulting analysis, therefore, compares the outcomes for African Americans to the outcomes for Whites. The estimate is -0.3950, showing a negative relationship between being African American and completing 15 college-level credits. The standard error is .0752. The Wald chi-square test measures  $p < .0001$ , thus the relationship is significant. 95% Wald Confidence Limits confirms a significant relationship. The odds ratio estimates show the point estimate at .674, reflecting the size

of the effect. The odds of the group coded as 1 (African American) successfully completing 15 college-level credits are .674 times the odds for the reference group (White) when the other six predictors are held constant. The null hypothesis, then, is rejected. Holding the other six factors constant, being African American does have a significant effect on completion of 15 college-level credits.

The third race/ethnicity comparison tests the null hypothesis: holding the other six factors constant, being Native American does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. For the logistic regression analysis, 'White' was coded as zero, the referent. 'Native American' was coded as 1. The resulting analysis, therefore, compares the outcomes for Native Americans to the outcomes for Whites. The estimate is -.5688, showing a negative relationship between being Native American and completing 15 college-level credits. The standard error is .1381. The Wald chi-square tests shows  $p < .0001$ , demonstrating that the relationship is significant. 95% Wald Confidence Limits confirms a significant relationship. The odds ratio estimates show the point estimate at .566, reflecting the size of the effect. The odds of the group coded 1 (Native American) successfully completing 15 college-level credits are .566 times the estimated odds for the reference group (White), when the other six predictors are held constant. The null hypothesis, then, is rejected. Holding the other six factors constant, being Native American does have a significant effect on completion of 15 college-level credits.

The fourth race/ethnicity comparison tests the null hypothesis: holding the other six factors constant, being Latino does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. For the

logistic regression analysis, 'White' was coded as zero, the referent. 'Latino' was coded as 1. The resulting analysis, therefore, compares the outcomes for Latino students to the outcomes for White students. The estimate is  $-.2060$ , showing a negative relationship between being Latino and completing 15 college-level credits. The standard error is  $.0606$ . The Wald chi-square test measures  $p = .0007$ , revealing that the relationship is significant. 95% Wald Confidence Limits confirms a significant relationship. The odds ratio estimates show the point estimate at  $.814$ , reflecting the size of the effect. The odds of a Latino student successfully completing 15 college-level credits are  $.814$  times the odds for White students, when the other six predictors are held constant. The null hypothesis, then, is rejected. Holding the other six factors constant, being Latino does have a significant effect on completion of 15 college-level credits.

The fifth and final race/ethnicity comparison tests the null hypothesis: holding the other six factors constant, being Multiracial or "other" race does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. The Wald chi-square test shows that the probability that this has an effect is  $p = .8730$ . Since this does not meet the  $.05$  test of significance, the effect is non-significant. The 95% Wald Confidence Limits also shows the relationship to be non-significant. The null hypothesis cannot be rejected: Holding the other six factors constant, being Multiracial or "other" race does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

**Research question 3: Age.** The third research question tests the null hypothesis: holding the other six factors constant, age does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. Like

race/ethnicity, the categorical independent variable of age is made up of more than two categories, so new variables were created. This has set up four comparisons. The age group 'under 20' is 0, the referent, and is compared to each of the other four categories of age separately. 'Under 20' is compared to 20-29; 'under 20' is compared to 30-39 and 'under 20' is compared to 40 and above. Each comparison is analyzed and the effect and significance measured.

The first comparison in the age series tests the null hypothesis: holding the other six factors constant, being 20-29 does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. For the logistic regression analysis, 'under 20' is coded as zero, the referent. 20-29 was coded as 1. The resulting analysis, therefore, compares the outcomes for 20-29 year-olds to the outcomes of students under 20. The estimate is  $-.1062$ , showing a negative relationship between being 20-29 and completing 15 college-level credits. The standard error is  $.0434$ . The Wald chi-square test measures  $p = .0144$ , indicating that the relationship is significant at the  $.05$  level. 95% Wald Confidence Limits confirms a significant relationship. The odds ratio estimates show the point estimate at  $.899$ , reflecting the size of the effect. The odds of students 20-29 successfully completing 15 college-level credits are  $.899$  times the estimated odds for students under 20, when the other six predictors are held constant. The null hypothesis, then, is rejected. Holding the other six factors constant, being 20-29 does have a significant effect on completion of 15 college-level credits.

The second age group comparison tests the null hypothesis: holding the other six factors constant, being 30-39 does not have a significant relationship with underprepared



students successfully transitioning into college-level coursework. For the logistic regression analysis, 'under 20' was coded zero, the referent. 30-39 was coded as 1. The resulting analysis, therefore, compares the outcomes for 30-39 year olds with the outcomes for students under 20. The Wald chi-square test shows that the probability that this has an effect is  $p = .0878$ . Since this does not meet the .05 test of significance, the effect is non-significant. The 95% Wald Confidence Limits also shows the relationship to be non-significant. The null hypothesis cannot be rejected: Holding the other six factors constant, being 30-39 does not have a significant relationship with underprepared students successfully transitioning into college-level coursework.

The third age group comparison tests the null hypothesis: holding the other six factors constant, being '40 and above' does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. For the logistic regression analysis, 'under 20' was coded as zero, the referent. '40 and above' was coded as 1. The resulting analysis, therefore, compares the outcomes for students 40 and above to the outcomes of students under 20. The estimate is .1757, showing a positive relationship between being 40 and above and completing 15 college-level credits. The standard error is .0843. The Wald chi-square test measures  $p = .0371$ , thus the relationship is significant at the .05 level. 95% Wald Confidence Limits confirms a significant relationship. The odds ratio estimates show the point estimate at 1.192, reflecting the size of the effect. The odds of a student who is 40 and above successfully completing 15 college-level credits is 1.192 times the odds for students under 20, when the other six predictors are held constant. The null hypothesis, then, is rejected. Holding

the other six factors constant, being 40 and above does have a significant effect on completion of 15 college-level credits.

**Research question 4: Enrollment status.** The null hypothesis for the fourth variable is: holding the other six factors constant, enrollment status (full-time or part-time), does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. Full-time is the referent (zero). The estimate is -1.2861, showing a negative relationship between being part-time and completing 15 college-level credits. The standard error is .0395. The Wald chi-square test measures  $p < .0001$ , revealing that the relationship is significant. 95% Wald Confidence Limits confirms a significant relationship. The odds ratio estimates show the point estimate at .276, demonstrating the size of the effect. The odds of a part-time student successfully completing 15 college-level credits are .276 times the odds of a full-time student doing so, when the other six predictors are held constant. The null hypothesis, then, is rejected. Holding the other six factors constant, being part-time does have a significant effect on completion of 15 college-level credits.

**Research question 5: Financial aid.** The fifth null hypothesis is: holding the other six factors constant, receipt of financial aid does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. Not receiving financial aid is the referent, zero. The estimate is .2093, showing a positive relationship between receiving financial aid and completing 15 college-level credits. The standard error is .0455. The Wald chi-square test measures  $p < .0001$ , showing that the relationship is significant. 95% Wald Confidence Limits confirms a significant relationship. The odds ratio estimates show the point estimate at 1.233, reflecting the size

of the effect. The odds of a student receiving financial aid successfully completing 15 college-level credits are 1.233 times the odds of a student not receiving financial aid, when the other six factors are held constant. The null hypothesis, then, is rejected. Holding the other six factors constant, receiving financial aid has a significant effect on completion of 15 college-level credits.

**Research question 6: Family status.** The sixth null hypothesis tests the statement that: holding the other six factors constant, family status does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. Since this variable is made up of more than two categories, new variables have been created to represent each category. This sets up two comparisons. “Without children or other dependents” is coded as zero, the referent, and is compared to the other two categories. “Without children or other dependents” is compared to “single parent with children or other dependents” and “without children or other dependents” is compared to “couple with children or other dependents.” Each comparison is analyzed separately and the effect and significance measured.

The first comparison tests the null hypothesis: holding the other six factors constant, being a single parent with children or other dependents does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. For the logistic regression analysis, without dependents is coded as zero, the referent, and single parent with dependents is coded as one. The estimate is -.2631, showing a negative relationship between being a single parent with dependents and successfully completing 15 college-level credits. The standard error is .0652. The Wald chi-square test measures  $p < .0001$ , demonstrating that the relationship

is significant. 95% Wald Confidence Limits confirms a significant relationship. The odds ratio estimates show the point estimate at 0.769, reflecting the size of the effect. The odds of a student who is single with dependents successfully completing 15 college-level credits is .769 times the odds for a student without dependents, when the other six predictors are held constant. The null hypothesis, then, is rejected. Holding the other six factors constant, being a single parent with dependents does have a significant effect on completion of 15 college-level credits.

The next comparison tests the null hypothesis: holding the other six factors constant, being a “couple with children or other dependents” does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. The Wald chi-square test shows that the probability is  $p = .0826$ . Since this does not meet the .05 test of significance, the effect is non-significant. The 95% Wald Confidence Limits also shows the relationship to be non-significant. The null hypothesis cannot be rejected: Holding the other six factors constant, being a “couple with children or other dependents” does not have a significant relationship with underprepared students successfully completing 15 college-level credits.

**Research question 7: Purpose.** The final research question tests the null hypothesis: holding the other six factors constant, purpose for attending college does not have a significant relationship with underprepared students successfully completing 15 college-level credits. Since the variable is made up of more than two categories, a new variable has been created. This sets up two comparisons. Students intending to transfer to a four-year college are coded as zero, the referent and compared to the other two kinds of students separately. Transfer is compared to students in a workforce program (not

intending to transfer) and then Transfer is compared to students attending for a Basic Skills program. Each comparison is analyzed and the effect and significance measured.

The first comparison, then, tests the null hypothesis: holding the other six factors constant, being a workforce student does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. Transfer was coded zero, the referent, and workforce was coded one. The estimate is 0.1259, showing a positive relationship between being a workforce student and completing 15 college-level credits. The standard error is 0.0497. The Wald chi-square test measure  $p = .0113$ , indicating that the relationship is significant at the .05 level. 95% Wald Confidence Limits confirms a significant relationship. The odds ratio estimates show the point estimate at 1.134, reflecting the size of the effect. The odds of students identified as workforce successfully completing 15 college-level credits are 1.134 times the odds for transfer students, when the other six predictors are held constant. The null hypothesis, then, is rejected. Holding the other six factors constant, being a workforce student does have a significant effect on completion of 15 college-level credits.

The final comparison tests the null hypothesis: holding the other six factors constant, being a basic skills student does not have a significant relationship with underprepared students successfully transitioning into college-level coursework. Transfer students are coded zero, the referent, and basic skills students are coded one. The estimate is -0.6335, showing a negative relationship between being a basic skills student and successfully completing 15 college-level credits. The standard error is .0919. The Wald chi-square tests measures  $p < .0001$ , thus the relationship is significant. 95% Wald Confidence Limits confirms a significant relationship. The odds ratio estimates show the

point estimate at .531, reflecting the size of the effect. The odds of basic skills students successfully completing 15 college-level credits are .531 times the odds for transfer students when the other six predictors are held constant. The null hypothesis, then, is rejected. Holding the other six factors constant, in comparison to a transfer student, being a basic skills student does have a significant effect on completion of 15 college-level credits.

### **Summary**

This study examined seven research questions and hypotheses about the relationships and group differences nonacademic variables had with underprepared community college students persisting to complete 15 college-level credits. The population for this study was comprised of 23,481 students who began college in the Washington State system of 34 public community college during the 2008-2009 school year with no prior college and took a pre-college math class during that first year. Because not all data was present for each record, 15,177 observations were used. Longitudinal data was collected from the years 2008-2009 through 2010-2011, tracking each student for three years. The data was obtained from the Washington State Board for Community and Technical Colleges.

An ex post facto design was used in this study to analyze group differences that may predict students' persistence to complete 15 college-level credits. Logistic regression was employed using the nonacademic variables gender, race/ethnicity, age, enrollment status, receipt of financial aid, family status and purpose for attending college as predictor variables. Several of the predictor variables had multiple categories that were

each compared to the referent. Achievement of 15 college-level credits during that three-year period was the dependent variable.

As shown in Table 3, logistic regression analysis results revealed that there was a statistically significant difference present for at least one category of each independent, predictor variable. Statistically significant comparisons are denoted with an asterisk. Differences in age, receipt of financial aid, family status, enrollment status (part-time compared to full-time), gender, purpose for attending college and race/ethnicity all showed a statistically significant effect on persistence at the .05 level. Chapter 5 presents a discussion of the research findings as they relate to the literature review, conclusions and recommendations for future research and practice.

## **Chapter 5**

### **Findings, Conclusions and Implications for Research and Practice**

#### **Introduction**

As indicated in Chapter 1, research has consistently found that college graduation rates are alarmingly low. Evidence has also been presented to show that few students who begin postsecondary education at a community college persist to a baccalaureate degree. This has significant social consequences, since these schools are intended to provide access to the benefits of higher education to a diversity of Americans. In addition, it has economic consequences, because it means there are a large group of people unprepared to fill jobs that require education and skills.

A critical contributing factor to this failure is that the majority of community college students are underprepared for college-level work. Fifty eight to 60% of community college students need to take one or more remedial, pre-college class (Adelman, 2004; Attewell et al., 2006; Bailey et al., 2010; Bettinger & Long, 2005; Dowd, 2007). This remedial requirement becomes an impediment to students successfully completing college. Only 25% of students who take remedial coursework at a community college continue to earn a certificate or degree (Attewell et al., 2006).

Prior research shows that nonacademic factors influence both the completion of remedial coursework and completion of the first year in college. Such factors are especially important in community colleges, where a student is more likely to be an ethnic minority, older, part-time, vocational, financially independent, lower socioeconomic status and first-generation college than a student in a four-year college



(Cohen & Brawer, 2008). There is a dearth of research, however, on how these factors affect that initial, critical transition from pre-college into college-level work.

The purpose of this study was to identify nonacademic factors that may influence the ability of underprepared, community college students to transition into college-level coursework. The quantitative study examined the relationship between seven, independent factors and students' completion of 15 college-level credits. The population for this study was 15,177 students representing all 34 colleges in the Washington State system of community colleges who started college in 2008-2009 academic year with no prior college and began with a pre-college, or remedial math class. Progress was measured over three years. Logistic regression was used to analyze the relationship between each independent variable and the dependent variable, with the other six independent variables held constant.

This chapter begins by discussing findings for each of the seven variables separately. Since most variables have more than two categories, and all variables have at least one category that is significantly different than the others, it is impossible to group the findings together as 'significant' and 'not significant.' In addition, although most of the findings have some support in the literature, there are nuances found here that vary from previous studies. For each variable, then, the results and literature review will be discussed. All the research will then be considered together in the conclusion, followed by recommendations for further research and implications for practice.

## **Findings**

**Research question 1: Gender.** The first factor this research explored was the relationship between gender and persistence. Can gender help predict whether a student

makes a successful transition? The analysis found that underprepared females were significantly more likely to complete 15 college-level credits than males. The effect size was quite large; the odds of a female completing were 1.254 times the odds of a male completing. Males made up 47.64% of the records analyzed. There is very little information in the literature about gender differences. Attewell et al. (2006) found that in the State of Ohio, women were more likely to require remediation than men (62% to 54%). This figure is not available for the current study. Bailey et al. (2010) did find men were less likely to complete their entire sequence of remedial courses than women were. Ishitani (2006) actually found that women were more likely to drop out in the second year than men (although this did not seem to be a factor in year one).

One important condition of this research is that the genders' success is compared with possible mitigating factors partialled out. If, for example, women were more likely to be single with dependents (which has a significant, negative relationship with success) that effect was partialled out here. Additionally, other factors like being part-time (which has a negative relationship with success, with a large effect size) may have affected women in past studies, while that effect would also be partialled out here. It would be necessary to examine that overlap more closely to determine if multiple influences were, indeed, at play for this sample.

Socially, culturally and economically, the roles of men and women in society have changed drastically in the last three decades. One demonstration of this is that "sex differences in educational attainment, which were small or nonexistent 30 years ago, are now substantial, with women outpacing men in every demographic group" (Bailey & Dynarski, 2011, p. 1). According to Bailey and Dynarski, this gap has increased recently,

and the current data shows men at 22% college graduation and women at 32%. This trend is also notable in high school graduation rates. In 2003 in the United States, 72% of females graduated compared to 65% of male students (Greene & Winters, 2006). This differential can be seen in this study, but the causes and effects are much broader than community college persistence.

**Research question 2: Race/Ethnicity.** The second research area to consider is the relationship between race/ethnicity and the successful completion of 15 college-level credits. Can the race or ethnicity of a student help predict whether they will make the transition? Each of five race/ethnicity groups was compared to White students, and two, Asian/Pacific Islander and Multiracial/other were not significantly different. Holding the other six factors constant, the odds of African American, Native American and Latino students completing the 15 college-level credits were all significantly less than they were for White students. African American students have only .674 times the odds of White students of successfully completing, while Native American students have .566 times the odds and Latino students have .814 times the odds of completing. The descriptive statistics show that African American students make up 6.34% of the records analyzed, while Native American students make up 1.69% and Latino students make up 10.96%.

The literature review presented several findings regarding race/ethnicity. Bettinger and Long (2005) found that, in the state of Ohio, a full 75% of Black and Hispanic students required remediation, while only 55% of White students did. Analyzing the NELS:88 data, following 6,879 students, Attewell et al. (2006) found that Black students were more likely to take remedial courses, even after controlling for factors such as academic preparation and high school skills tests. Bahr (2010) also found

that Black and Hispanic students were more likely to start remedial math at the lowest level (17.4% of White students began remediation at this level, while 40.8% of Black students and 31% of Hispanic students did). If this is true for Washington State as well, that a bigger percentage of Black and Hispanic students take remedial math courses, and a bigger percentage start at the lowest level, the significance of the negative outcomes for Black and Hispanic students in this study would be even more critical.

Looking specifically at math remediation, Bahr (2010) found that White students successfully complete their remediation in math at 3.1 times the success rate of Black students and 1.6 times that of Hispanic students. This confirms this study's results that underprepared Black and Latino students transition into college-level classes at a lower rate than White students. In a study of the attrition of 4-year college students which did not consider the students' level of preparedness, Johnson (2006) had findings that conflicted with this study's outcomes. She found that Caucasian and minority students were equally as likely to leave in the first semester.

Stewart (2010), however, found ethnicity to be an equal factor for both students who start in remediation and students who do not at the University of Oklahoma. Unlike this study, she found both Asian/Pacific Islander and African American students to persist at a greater rate than White students. In agreement with this study, Stewart did find Hispanic students to persist at a lower rate than White students, and Native American students to persist at the lowest rate of all groups analyzed.

Racial inequality in the United States is certainly a broader issue than college persistence and it is difficult to separate out the effects of education from other effects. African American and Hispanic students are less likely to graduate from high school. In

2003 “Nationally, the graduation rate for White students was 78%, compared with 72% for Asian students, 55% for African-American students, and 53% for Hispanic students” (Greene & Winters, 2006, para. 2). Those that get to college graduate at lower rates than White students. On average, 60% of White students who start college have earned bachelor's degrees six years later. But only 49% of Hispanic students and 40% of Black students do (Gonzalez, 2010). The implications of this are vast. As stated earlier, each increase in education is positively associated with an increase in personal income (Baum et al., 2006; Kelly, 2005). Unemployment rates for 2010 were 8.7% for Whites, 12.5% for Hispanics and 16% for Blacks (U.S. Department of Labor, 2011). In 2008 the African-American poverty rate was 24.6%, the Hispanic rate was 23.2%, and the White rate was 8.6% (Weller, 2009). Any change that could improve the persistence of African American, Hispanic or Native American students, then, could have lifetime effects on employment and prosperity.

**Research question 3: Age.** The next factor this study investigated was age. Does the age of a student influence their ability to persist? This research determined that, compared to students under 20, underprepared students aged 20-29 were significantly less likely to complete 15 college-level credits. The odds of completion are .899 times that of under-20-year olds. Comparison of students under 20 with students aged 30-39 did not show a significant difference. Comparison with students 40 and above showed that the oldest group of students was significantly more likely to be successful, the odds of completion 1.192 greater than those of under-20-year olds. The under-20 group is the largest at 47.68% of the total sample. The 20-29 year old age group is also very large,

making up 34.86% of the students. The 30-39 year old group includes 10.38%, while the 40-plus group is the smallest with 7.08%.

Calcagno et al. (2007) looked specifically at the difference between older and younger students. They reported that 60% of younger first-time students at a 2-year public college earned a certificate or transferred after six years, compared to only 40% for older students. They also posit that older students are more likely to have characteristics that affect persistence, like work, caregiving, engagement and part-time status. Hagedorn (2005) also found that older students are more affected by time pressure and family responsibilities. She also found, however, that degree completion was not as big of a motivation for this group. GPA and completion of courses, according to Hagedorn, actually went up as students got older.

Related to level of preparedness, Attewell et al. (2006) found that older and nontraditional students were actually more likely to require remediation. Calcagno et al. (2007) found this to be true for math remediation, but not for verbal skills. Bailey et al. (2010) found that older students were less likely to complete their sequence of remedial courses. The descriptive statistics for this study did not include information about what percentage of students require remediation for each age group.

The factor that is most intriguing about the results of this study is that the effect is not linear: the oldest age group actually fares the best as far as completion of 15 college-level credits. The 30-39 age group is similar to under 20, while the 40-plus age group actually completes at a higher rate. The age group that has the lowest odds of completion is limited to the 20-29 year old students. This raises a range of questions about what factors contribute to this disparity. Other research identified having dependents and being

workforce-focused students may contribute to lower completion for older students.

Neither of those factors should apply to this result, however, since the effect of students having dependents and the effect of them being workforce (as opposed to transfer-focused) should be factored out, since that was held constant in the logistic regression analysis.

Another factor to consider is why these students entered college at a later age. It is important to remember that the data included limits records to students with no prior college *at their current institution*, so it's possible that at least some of these students could have higher education experience elsewhere. There presumably is a large difference between students who begin college at 20 or 21, relatively close to high school, and students in their late 20s, who may have entered the workforce or pursued other goals during that decade. Even 20-year olds, however, would have a disadvantage over 18-year olds if they are two years removed from high school, their most recent academic experience. It would have been possible with this research to break the age groups down into smaller sections, or even by year. That would provide additional information critical to evaluating the cause of this issue.

It is also of interest to take into consideration an historical viewpoint. Is it true that the group of students 20-29 year olds have had difficulty persisting in college throughout history? Or is it possible that this effect is unique to, or at least more prominent in, this generation? Perhaps the specific economic and cultural circumstances of people who were 20-29 in 2008 differentiate them from other groups in that era. It is possible that 20-29 year olds had a more difficult time finding purchase in the working world in 2008 with the economic crisis, turning to college as a second choice. Were 20-

29 year olds more likely to be unemployed in 2008, leading them to turn to college as a second choice? Or were there other environmental factors that changed during that decade?

**Research question 4: Enrollment status.** In addition to demographic factors, this study considered other, nonacademic factors such as enrollment status. Do part-time students, those carrying less than 12 credits per quarter, persist at a different rate than full-time students. This research shows that underprepared part-time students are significantly less like to complete 15 college-level credits than full-time students when the other six, nonacademic variables are held constant. The effect size is, by far, the largest of any of the tests. Part-time students have just .276 times the odds of completing than full-time students do. Part-time students make up 33.96% of the students in the sample. It is important to remember, here, that students in the sample were given three academic years to complete the 15 credits, so even if a student delayed classes, or took just one class per term, length of completion should not have been a factor in this research.

Fike and Fike (2008) found that number of semester hours enrolled in (and dropped) during the first term had an effect on first year retention for community college students. Johnson (2006) also found that part-time students were more likely to leave, especially in the initial semesters. Bailey et al. (2010) found that part-time students were less likely to complete their sequence of remedial courses. Cohen and Brawer (2008) stated that community college students were more likely to be part-time than students at a four-year school. Calcagno et al. (2007) found that older students were more likely to be part-time.



There are a number of reasons students may attend college part-time rather than full-time. They could be working, responsible for child or dependent care, or held back by financial considerations. Some students who find college course work a challenge may intentionally stay part-time in order to manage their class loads. These considerations make the logistic regression analysis especially valuable. If students were part-time because of dependent care, or because of access to financial aid, the effect of each of those factors was controlled so the effect of the enrollment status can be seen separately. It is important to consider, though, that students who were part-time *and* unable to receive financial aid, or part-time *and* single parents, may be even less likely to persist than the odds here show.

One area to explore is the access to support services. Participation in support services has been shown to increase persistence (Fike & Fike, 2008) as has using campus resources, such as the library (Garcia, 2000). The literature review also supports the benefits of advising (Bahr, 2008a; Escobedo, 2007). It would be important to survey if part-time students have access, or take advantage of, services like advising, tutoring, or college engagement, which may seem more available to full-time students. The long completion time required for part-time students may seem daunting, and additional requirements, such as remediation, might make this seem even more impossible. Two or three remedial courses, especially if one or more have to be repeated, may draw out completion by a year or more. The cost considerations may also be a factor, with large increases in tuition each year of the study.

**Research question 5: Financial aid.** Another factor this study analyzed was financial aid. Were students who received financial aid less or more likely to successfully

transition? This research found that, holding the other six factors constant, receipt of financial aid had a significant effect on underprepared students successfully completing 15 college-level credits. Since this study did not have access to family income information, it may be assumed that recipients of a Pell grant were lower income than students who did not receive financial aid. If this were true, the receipt of financial aid may have indicated the effect of lower socioeconomic status and demonstrated a negative effect on completion. The opposite, in fact, was true. Underprepared students receiving Pell grants had 1.233 times the odds of completing 15 college-level credits than those who did not receive the grants. This is one of the largest effect sizes of all of the factors analyzed.

Research by Fike and Fike (2008) examined factors that predicted first-year community college students retention for the first term, and then for the first year. Receiving financial aid had a positive correlation with retention for both term and year which was significant and had a comparatively large effect size. Stewart (2010) found that students receiving any type of financial aid were more likely to persist, and that this was equally true for students requiring remediation and students not requiring remediation. Garcia (2000), on the other hand, found that financial aid had no significant effect on persistence, either positive or negative. She did, however, find that perceived financial difficulty decreased persistence.

One factor to consider is the access to the financial aid process and support going through that process. It takes a good deal of savvy to identify and complete the forms and requirements and meet the deadlines to apply for financial aid. It could be that people at the lowest income level are less likely to have the resources to navigate that system. This

may be a similar effect to people eating expensive, unhealthy foods because of lack of proximity to fresh grocery. The easiest and most straightforward path might not lead through the financial aid office. It is not possible to determine this relationship, however, without income or socioeconomic data.

It is also possible that not having financial aid leads to insecurity. Having long remediation, or not passing early levels of required remediation, may cause students to wonder if they are going to be able to continue to afford college through completion. The ‘to go or not go’ decision is made all over again at the end of the each quarter, rather than with the annual cycle of financial aid. One failed class could derail the momentum and forestall enrollment for the next term. Finally, financial aid might be an incentive to keep grades and persistence, since dropping or failing classes could lead to loss of that aid. Receiving financial aid, then, may contribute to a more stable environment.

**Research question 6: Family status.** This study also evaluated the impact that having children had on students’ persistence. The analysis of family status in this research had mixed results. Holding the other six factors constant, being in a couple with children or other dependents did not significantly affect a student’s chances of completing 15 college-level credits, when compared to being without dependents. Being *single* with children or other dependents, however, did have a significant variance from being without children or other dependents. Single parents had just .769 times the odds of completing than people without children had. So, it is not having dependents that is significant, it is being solely responsible for those dependents. In this study, 11.64% of the students were single with dependents, and 14.49% were couple with dependents. This

large number of the sample having children, more than 26%, is one of the factors that separate community colleges from four-year colleges and universities.

There is a deficit of research on family status and how it affects retention and completion. The fact that most research in higher education has been done with traditional-aged students in four-year colleges and universities explains that deficit. Bradburn (2002) finds that an increase in dependents increases departure; so having children *while* in college increases the chances of dropping out. There is no study in the literature review that identified the effect that starting college with dependents has on students. It is critical, then, not only to study this group, but to differentiate the students who are single parents. Since couples with children do not have a completion disadvantage, schools and research should focus on the unique needs of single parents.

**Research question 7: Purpose.** The final factor evaluated in this study was purpose for attending school. Students with the intent to transfer were compared to students completing workforce certificates and degrees, and then students with the intent to transfer were compared to basic skills students. It is important to qualify, as stated in the assumptions, that students self-identify their purpose. It is possible that students may misclassify themselves. Although basic skills students have a very low odds of completion (.531 times transfer students), they are a small portion of the sample, just 3.76%. The primary comparison, then is between transfer students (74.47% of the sample) and workforce students (21.76% of the sample). In this study, workforce students had a significantly higher odds of completing: 1.134 the odds of transfer students.

Since most of the research has been conducted at the four-year level, there is very little information in the literature about workforce students. Cohen and Brawer (2008)

state that community college students are more likely to be vocational. They are also more likely to be older and part-time. Bailey et al. (2010) found that vocational students are less likely to complete their remedial sequence. It is possible that the reason this research found workforce students to fare better is because the other factors were partialled out. If workforce students, for example, tend to be older, more likely to have children, or more likely to be part-time, those effects would be factored out in this analysis.

It is also true, in the State of Washington, that many vocational programs require less remediation in math than transfer programs. A student in a professional-technical program, for example, may only need to complete arithmetic and pre-algebra remediation before continuing on to a college-level business math or other applied math. Transfer students, on the other hand, may have to take as many as two additional remediation courses before proceeding to college-level math or pre-calculus. Depth of remediation requirement, then, may have influenced this outcome.

### ***Conclusion***

The issues addressed in this research require multi-scalar analysis. Differences in the achievement by race, age, access to financial support, gender and family status have broad social and cultural implications and causes that also influence factors like employment and income level.

Access to a college education and the completion of it have become more stratified by race, ethnicity, and socioeconomic status (SES). Americans can tolerate a lot of inequality compared with people of other nations, but only if everyone has a chance at upward mobility. But both economic mobility and educational mobility seem to be slowing with each generation. (Carnevale & Strohl, 2010, p. 73)

To exacerbate this challenge, there is now the imposing backdrop of economic challenges in the United States. Federal higher education policies regarding financial aid and state and local policies affecting tuition costs also have a significant impact on this disparity. Finally, analysis of deficits in the educational system itself must include high schools, elementary schools and preschool preparedness.

The scope of this analysis, however, is limited to the higher education institutions. What do these results mean for the policies and practices of community colleges as institutions? The significance of this study is that it reinforced the need to make a commitment to all students completing that very first quarter. This begins helping people apply for financial aid to make sure all students have access to the increased chance of persistence that financial aid receipt provides. An example is the VITA program at Edmonds Community College. Accounting students volunteer to complete tax filing for the community. This year the program extended that service to complete FAFSA forms as well (Edmonds Community College, 2012). These services can be expanded to target specific communities or groups. Since increased advising has been shown to be effective (Bahr, 2008a; Escobedo, 2007) this should be required. Mandatory advising influences the success of all students, instead of limiting the benefits to students who are already help-seeking and comfortable navigating the system. Academic aid could help students who have been out of high school a couple of years refresh and prepare for college.

The student's first quarter in the classroom should be designed to provide students with the experiences shown to improve completion and retention. Contextualized learning and learning communities should be widely available and encouraged or required for students testing into remedial courses. Supplemental instruction and tutoring

should be a required add-on to these first quarter classes so that their proven benefits are not limited to self-selecting students. Shorter or modularized courses should be developed so students can gain purchase, even if they do not complete an entire quarter.

### **Recommendations for Further Research**

The findings of this study point to the following recommendations regarding further research that would contribute additional insight into questions regarding remedial education and success into college-level work.

- Qualitative research should be conducted to explore the experience of being an underprepared student.
  - Conduct focus groups or score surveys to examine differences by group, for example part-time compared to full-time, or Latino compared to White. Questions could be asked about what aids students' success and what barriers derail them.
  - Research should be conducted to understand how students use support services. Surveys could determine, for example, if part-time students use particular services (from advising to student life) less than full-time students or if males use them less than females.
  - Research with single parents should identify barriers they have to succeeding in higher education. Questions could be asked about finances, childcare, study time and engagement with college community.
- The review of the literature indicated that depth of remediation was one of the biggest determining factors in a student's ability to complete a remedial sequence. Further research should determine how placement and the number

of levels of remediation required for each student is related to these nonacademic factors. It would be important to understand the combined effect those factors have on students' ability to transition into college-level work.

- Since financial aid has a significant, positive affect on students' success, more research on who obtains aid and how they obtain it is important.
  - Determine the relationship of receipt of aid with socioeconomic status to determine if people in the lowest quintile are, in fact, more likely to get aid than students in higher quintiles.
  - Study the access to aid at different colleges and for different groups of people.
  - Conduct qualitative research to learn more about what families know about financial aid and the resources they have to help them apply.
  - Compare financial aid receipt for full- and part-time students.
- Continue this logistic regression analysis to examine more closely groups that have lower odds of completing.
  - Since age does have a significant effect on success, it would be useful to conduct logistic regression with narrower age groups, or even to analyze each age separately. This would determine which groups of students within the decade 20-29 are least likely to successfully transition and allow practitioners to focus on the group with the most need.
  - This analysis separately evaluated the effect of each nonacademic variable. It would be useful to determine the combined effect that groups of variables have. For example, what are the odds of a student who is



African American and male of successfully transitioning into college-level?

- All of the students in this study entered the community college with a deficit.

It would be useful to know, in each demographic group, what the likelihood of that deficit based on these nonacademic factors. In order to determine this, additional descriptive statistics is required to determine what percentage, in Washington State of:

- Black, Hispanic and Native American students need remediation compared to Whites.
- Students in each age group require remediation.
- Males requiring remediation, in comparison with females.

### **Implications for Practice:**

Although the primary question of this study was research based, the findings point to three implications for practice.

- Provide support programs that reach a broader group of students, especially those with lower odds of success.
  - Make mandatory support services like advising and tutoring, so the benefit is not limited to help-seeking students.
  - Make sure that part-time students, even students enrolling in just one class, are aware of and have the same access to financial aid, advising, orientation and support services that full-time students have.
  - Provide support for applying for financial aid, especially for groups with other predictors that have a negative relationship with completion, such as

students who are single with dependents, part-time, male, basic skills, and African American, Native American and Latino.

- Provide support, mentoring, childcare and financial assistance to students who are single with children or other dependents.
- Create first quarter experiences that increase students' chance of success and completion.
  - Make programs widely available so all students have an opportunity (or requirement) to spend the first quarter in contextualized learning, or in a learning community.
  - Give first-quarter students additional support, tutoring, advising, supplemental instruction.
- Move students through remedial sequences of math more quickly.
  - Develop programs for students who have had a gap between high school and college, reviewing study skills or even refreshing basic skills that may decrease the amount of time spent in remediation.
  - Focus on ways to shorten the remedial sequence in math.
  - Modularize remedial math courses so students can move forward even if they cannot complete a full term.

As put forward in the literature review, successful change occurs when entire colleges or systems embrace the goals of successful remediation and persistence.

Organizational learning needs to take place so each institution can develop systems that are successfully implemented and institutionalized. College leadership, student services and academic faculty need to embrace reform that improves the experience of all

students. Continued research, both quantitative and qualitative, should explore the student experience and measure the benefits of changes for students, and for specific groups of students that have lower odds of completion.

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Higher Education Coordinating Board.

## **Appendix A**

### **Approval Letter**



April 2, 2012

University of Lincoln, Nebraska  
Research Compliance Services  
312 N. 14th St., Ste 209, Alex West  
Lincoln, NE 68588-0408

To whom it may concern:

Ann Paulson has approval to receive and use specific de-identified data from the Washington State Board for Community and Technical Colleges. All records made available to Ann are de-identified. She has signed a Notice of Non-Disclosure that limits the use of data to her and specifies the data may be used only for aggregate reporting and research purposes.

Sincerely,

David Prince, Director for Research and Planning  
Washington State Board for Community and Technical Colleges  
PO Box 42495  
Olympia, WA 98504-2495  
(360)704-4347

cc: Ann Paulson



## **Appendix B**

### **The SAS System**

## The SAS System

*The LOGISTIC Procedure*

Model Information		
Data Set	PAUL.FINAL2	
Response Variable	MaxOf15ClvICr_Point	MaxOf15ClvICr_Point
Number of Response Levels	2	
Model	binary logit	
Optimization Technique	Fisher's scoring	

Number of Observations Read	23481
Number of Observations Used	15177

Response Profile		
Ordered Value	MaxOf15ClvICr_Point	Total Frequency
1	1	10782
2	0	4395

*Probability modeled is MaxOf15ClvICr\_Point=1.*

**Note** 8304 observations were deleted due to missing values for the response or explanatory variables.

Model Convergence Status
Convergence criterion (GCONV=1E-8) satisfied.

Model Fit Statistics		
Criterion	Intercept Only	Intercept and Covariates
AIC	18268.364	16854.214
SC	18275.991	16976.255
-2 Log L	18266.364	16822.214

Testing Global Null Hypothesis: BETA=0			
Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	1444.1494	15	<.0001
Score	1468.7980	15	<.0001
Wald	1356.7100	15	<.0001

Analysis of Maximum Likelihood Estimates					
Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	1.3095	0.0401	1067.1049	<.0001
age_prim2	1	-0.1062	0.0434	5.9940	0.0144
age_prim3	1	0.1231	0.0721	2.9148	0.0878
age_prim4	1	0.1757	0.0843	4.3472	0.0371
Aid_Type_Ind	1	0.2093	0.0455	21.1726	<.0001
fam_statd1	1	-0.2631	0.0652	16.2873	<.0001
fam_statd2	1	0.1032	0.0595	3.0138	0.0826
PT_FT	1	-1.2861	0.0395	1061.9514	<.0001
gen_d1	1	0.2265	0.0386	34.4686	<.0001
student_trdW1	1	0.1259	0.0497	6.4112	0.0113
student_trdB2	1	-0.6335	0.0919	47.5054	<.0001
raced1	1	0.1110	0.0784	2.0086	0.1564
raced2	1	-0.3950	0.0752	27.5743	<.0001
raced3	1	-0.5688	0.1381	16.9622	<.0001
raced4	1	-0.2060	0.0606	11.5656	0.0007
raced5	1	0.0130	0.0813	0.0255	0.8730

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
age_prim2	0.899	0.826	0.979
age_prim3	1.131	0.982	1.303
age_prim4	1.192	1.011	1.406
Aid_Type_Ind	1.233	1.128	1.348
fam_statd1	0.769	0.677	0.873

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
fam_statd2	1.109	0.987	1.246
PT_FT	0.276	0.256	0.299
gen_d1	1.254	1.163	1.353
student_trdW1	1.134	1.029	1.250
student_trdB2	0.531	0.443	0.635
raced1	1.117	0.958	1.303
raced2	0.674	0.581	0.781
raced3	0.566	0.432	0.742
raced4	0.814	0.723	0.916
raced5	1.013	0.864	1.188

Association of Predicted Probabilities and Observed Responses			
Percent Concordant	67.3	Somers' D	0.369
Percent Discordant	30.5	Gamma	0.377
Percent Tied	2.2	Tau-a	0.152
Pairs	47386890	c	0.684