

**RISK MODELING OF FIRST YEAR STUDENT RETENTION AT A COMMUNITY COLLEGE:
AN EARLY EXPLORATION OF DATA, FEASIBILITY, AND APPLICATION**

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ABSTRACT

Set in a medium sized, suburban, two-year community college, this study explores the initial development of an actionable predictive risk model for first-year retention based on data currently collected and to identify target variables upon which data should be collected to improve future versions of the model. Institutional data was analyzed by means of Analysis of Variance and Logistic Regression and Ordinary Least Squares Regression analyses. Results suggested there are several important variables for which data was available but the risk model as developed has relatively low predictive power. The results of this study are used to inform College administrators, faculty, and staff about risk modeling, conclusions that can be drawn from existing data, and provide guidance on additional relevant variables upon which data should be collected. Additionally, recommendations for future research are discussed for this study's institution and the field of education as it relates to Community Colleges.

This dissertation is dedicated to
my parents, Richard and Nancy Schwartz,
who have always encouraged and supported my education
and
my wife, Jennifer,
who in addition to encouraging and supporting my educational pursuits
has been my chief editor for nearly every paper I have written
since our first meeting in English class those many years ago.

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TABLE OF CONTENTS

ABSTRACT	II
ACKNOWLEDGEMENTS.....	IV
LIST OF TABLES	VIII
LIST OF FIGURES	IX
CHAPTER 1: INTRODUCTION	1
Background Information.....	1
Statement of the Problem.....	7
Purpose of the Study	8
Research Questions	8
Role of Researcher.....	9
Definition of Terms.....	10
CHAPTER 2: LITERATURE REVIEW.....	12
General Information	12
Community Colleges, An historical overview in brief.....	14
Foundational Theories:.....	16
Astin’s “Theory” of Student Involvement.	16
Tinto’s Theory of Individual Departure.	19
Critique of Tinto’s Theory of Individual Departure.	22
Risk Modeling	25
Risk Modeling: Cautions	27
CHAPTER 3: METHODOLOGY	32
Restatement of Research Question.....	32
Population and Data Sources	32
CHAPTER 4: RESULTS	40
Demographics and Other Characteristics of the Sample	40
Analyses and Results Relevant to the Research Question	43
Regression Analysis	47
CHAPTER 5: DISCUSSION	51
Summary of Findings	51
Discussion of Findings.....	51
Implications	57
General Recommendations.....	58
Additional	61
Limitations of the Study	74
The data set.....	74
The sample size	74
The assumptions (a moving target)	75

The methodology and software	75
The lack of data	75
Correlation on independent variables	76
Future Work & Research	76
Variables and data collection	76
Adaptive feedback.....	76
Intervention measures	77
Beyond the first-year	77
Student success research agenda	77
Conclusion	78
REFERENCES	80

LIST OF TABLES

Table	Page
1. Table 4.1: Demographics and Other Characteristics of the Sample	41
2. Table 4.2: Summary of Retention Statistics for Continuous and Dichotomous Variables.....	44
3. Table 4.3: Summary of Retention Statistics for Categorical and Ordinal Variables.....	45-46
4. Table 4.4: Independent Variables Sorted (descending) by Effect Size on First-Year Retention	47
5. Table 4.5: Logistic Listwise Stepwise Regression for First-Year Retention.....	48
6. Table 4.6: Linear Pairwise Stepwise Regression for First-Year Retention	48

LIST OF FIGURES

Figure	Page
1. Figure 2.1: Tinto's Theory of Individual Departure – A longitudinal Model of Institutional Departure (Pascarella & Terenzini, 2005)	20

CHAPTER 1: INTRODUCTION

Background Information

There is an extensive and ever growing body of literature relating to undergraduate student retention ranging from factors for prediction to best practices for intervention. Despite this vast body of work, definitive theories and actionable best practices have proven elusive. The seminal theories of Tinto's Theory of Individual Departure (1975, 1993, 2006, 2012a, 2012b, 2012c, 2013) and Astin's Theory of Involvement (1977, 1985, 1993, 1998, 1999, 2012; Astin, Astin, & Lindholm, 2011) have provided an excellent framework upon which practitioners have been able to implement policies to help better retain and serve students. These theories provide a good foundation but have only been able to "explain" some of the issues and their limitations have led others to attempt to expand and refine their work.

The growing interest of early identification and ultimately early intervention stems not only from an altruistic desire to assist student learning and completion but also from a practical aspect of finite resources, and as of recent - diminishing resources i.e. "the need to do more with less". The demands being placed on higher education are significant. More students, parents, and legislators are demanding greater access at lower costs. These demands are driven in part by the fact that higher levels of education are seen as a gateway to employment (Mudge & Higgins, 2010) and generally translate to greater economic independence (Bailey, Jenkins, Leinbach, 2007; Bailey et al., 2004; Grubb, 1999a, 1999b; Prince & Jenkins, 2005; Quinley & Quinley, 2000). More students, including those who might not have traditionally attended college either due

to lack of interest or low aptitude, are now seeking or being encouraged to attend college. Colleges in general and community colleges specifically are seeing increasing numbers of underprepared students enrolling on their campuses.

The successful completion of the higher education process follows a simple logical progression by which students must have access to higher education, choose a program of study, then persist in their chosen program of study ultimately leading to timely graduation with their certificate, associates or baccalaureate degree. There have been great strides in increasing access to higher education to many populations, with more work still needed; however, focusing merely on access is only a “half-solution” and more must be done to help students persist and ultimately graduate in a timely manner. The traditional admissions process at most selective institutions has been to screen students for entry based primarily on two cognitive variables – past performance (e.g. high school coursework and performance) and ability (e.g. SAT scores) (Harackiewicz et al., 2002). However, it is becoming clear that cognitive variables alone do not provide a complete picture and numerous researchers are advocating that inclusion of non-cognitive variables that relate to characteristics including attributional styles , expectancies, goal setting, self-efficacy, financial resources and motivation among others is a vital necessity (Advisory Council on Student Financial Assistance, 2012; Astin, 1993, 1998, 1999, 2012; Astin, Astin, & Lindholm, 2011; Beck & Davidson, 2001; Gifford, Briceño-Perriott & Mianzo, 2006; Harackiewicz, Barron, Tauer & Elliot, 2002; Mattson, 2007; May, 1923; Munroe, 1945; Noffle & Robins, 2007; Ransdell, 2001; Thomas, Kuncel & Crede, 2007; Tinto, 1993 2012a, 2012b, 2012c, 2013).

In following the logical progression of access to retention to completion, it is well understood that retention rates are commonly lowest for first year students and improve with each subsequent year of study. For example, as cited by the National Center for Education Statistics in 2011, 13.8% of students left their initial institution of higher learning after their first year this drops to 10.6% in the second year of study, with further declines to 5.6%, 3.4%, 2.0%, and 1.0% in the subsequent third through sixth years of study. Since the greatest attrition occurs in the first year, by focusing on first year students the institution can have the greatest impact on student retention with its limited resources, i.e. the “biggest bang for the buck.” As an emphasis of a “half-solution”, Dowd (2003) points to a greater need to examine the outcomes of students rather than a focus on access alone, a point confirmed by Dickert-Conlin and Rubinstein (2007) in that “Without access and [emphasis added] persistence, higher education does not necessarily mean success for lower-income individuals and does not spur greater economic opportunity and mobility nor reduce existing gaps between the ‘haves’ and ‘have-nots’” (p. 1).

Current demographic trends and State fiscal shortfalls are complicating the matter for both selective institutions as well as for community colleges. Census data are showing that there are almost half a million fewer high school graduates from 2012 to 2013 (College Enrollment Declines for Second Year in a Row, 2014) with acute declines in the Northeast and expectations for declines to persist from the 2009 highs (Maciag, 2013). The demographic declines in conjunction with dwindling state appropriations is causing greater competition among institutions of higher learning, both selective and

non-selective, to admit students from an ever shrinking pool of both well-prepared and under-prepared students. It is, therefore, logical to assume that many selective institutions in balancing their individual access-retention-success equation may be inclined to admit a greater proportion of under-prepared students or students from demographic populations different from their traditional populations in an effort to bolster enrollment and potentially result in greater numbers of students who struggle to succeed (Ewell & Wellman, 2007). This competition over students and the need to fill dormitories and classrooms at selective institutions may have the consequence of syphoning away students, and likely the “stronger students”, which might otherwise have enrolled in a non-selective community college reinforcing the importance as stressed by Perna and Thomas (2006) that each institution must understand its students’ situation in context [emphasis added] and “meet the student where they are at” if they are to successfully retain and graduate the student.

By focusing on retention in general and first year retention specifically there is the possibility of a win-win-win situation for the student, the institution, and society as a whole. From the students’ perspective, as noted above, retention in the first year leads to improved persistence in subsequent years leading to improved graduation rates and consequently improved access to employment (Mudge & Higgins, 2010) as well as improved long-term economic opportunity (Bailey et al., 2007; Bailey et al., 2004; Grubb, 1999a, 1999b; Prince & Jenkins, 2005; Quinley & Quinley, 2000). Unfortunately, an added complexity exists in that gains are disproportionate, favoring higher-income

students over lower-income students, having the tendency to increase the economic and social divide between the two groups (Labaree, 2007).

From an institutional perspective there are numerous wins as well. By graduating more students there is a larger base from which the school can fundraise. With a greater notoriety for successfully graduating students comes an increased ability to attract new students (i.e. success breeds success). Similarly, with improved graduation rates the institution can more easily resist demands to maintain or reduce tuition and may be more successful at increasing its tuition (i.e., a value added premium to attend a successful institution). If the institution is a public one and reliant on state appropriations, improved graduation rates will also improve its ability to garner a greater share of dwindling appropriations (i.e., funding dollars awarded to winning programs) which may become especially important if the trend toward performance based funding continues. Another win for the institution is the mere fact that it makes good business sense to retain an existing student versus recruiting a new student, as the business axiom goes it is far more cost effective to retain an existing customer than it is to find a new one. This has been documented that it is more cost effective to retain and graduate students than to replace them (Belfield, Crosta, & Jenkins, 2014; Jenkins, 2011; Jenkins, Kadlec, & Votruba, 2014).

From a societal perspective many legislators and taxpayers debate if higher education is a public benefit, warranting taxpayer support, or private benefit, suggesting limited if any taxpayer support; however, there is a body of evidence noting the public benefits of higher education (Pasque, 2007). For example, with a more educated

citizenry earning higher wages there will be a larger base from which to tax as well as greater economic stimulus with their improved spending power. Similarly, an educated workforce is generally a more efficient and more productive workforce. If retention and graduation rates improve, it is expected that there would be less wasted financial aid funds and a reduced need for taxpayer funded bailouts for student-loan relief resulting in more efficient state and national financial aid budgets.

All of the stated issues become more complex when factoring in community colleges which by their very mission are non-selective open enrollment institutions intended to service the surrounding communities. Community colleges disproportionately enroll at-risk students (i.e. students or populations that are less likely than the general population to achieve educational goals, *see below Definition of Terms: At-Risk*) and rely most heavily on state appropriations for all aspects of their operations including innovations. For some students the community college is the “college of last resort” either due to costs or the fact that the student was not accepted by his or her preferred, selective institution. Similarly, many community college students intend to transfer, completing the first or perhaps first and second years of their four year degree at the community college. These students may experience challenges when they transition and integrate into their four-year institution, which although similar to the challenges they experienced integrating to the community college are situationally entirely different.

There is a recognized importance of postsecondary attainment to national, state, and local economic growth, as well as its importance assist with socio-economic

equalities. The policy discourse has shifted, particularly in the wake of the 2009 Obama American Graduation Initiative (Kuntz, Gildersleeve, & Pasque, 2011; Kotamraju & Blackman, 2011; Obama, 2009). Community colleges will need to “meet [their] students where they are at” (Perna & Thomas, 2006) to best deploy scarce fiscal and human resources. Educational leaders will need to find a better way to identify at-risk students and match them with timely services to help retain them.

Statement of the Problem

Student retention in higher education is a complex issue that has been studied greatly from various perspectives, in multiple settings, and using numerous variables. Although some meaningful generalities have been drawn, the diverse and sometimes unique nature of a student body or institutional environment calls into question the direct transferability of policies, programs, or risk models between even approximately similar institutions. It is, therefore, important for each institution to understand and identify what can (and cannot) be generalized and to validate the findings of the literature for “their institution” in order to develop and implement meaningful local solutions that will work for “their students”. Even in understanding the screening criteria at more selective institutions may prove helpful to less selective or open-enrollment institutions in matching students with appropriate resources.

Community colleges by their very nature are unique and charged with serving the unique community in which they are located – as the axiom goes “The only thing typical about a community college student is that they are atypical.” Although there is a great deal of excellent research to draw upon, it is important for Community colleges to

filter and adapt the literature to their unique make-up and the needs of their students and the environment in which they find themselves.

In an environment of dwindling resources and increasing competition it is becoming more critical to deploy scarce resources in a way that they can have the greatest effect. Predictive risk modeling and the timely pairing of appropriate intervention may prove helpful in the deployment of resources to enhance retention and institutional efficiency at institutions that currently do not utilize such data driven decision making.

Purpose of the Study

The impetus of this study is to use and build upon prior retention studies (Astin, 1975, 1984, 1993, 1998, 1999, 2012; Astin, Astin, & Lindholm, 2011; Baird, 2000; Bean, 1980, 2005; Bean & Eaton, 2000, 2002; Cabrera, Castañeda, Nora & Hengstler 1990; Tierney, 2000; Tinto, 1975) to better understand and identify factors that correlate with first-year student retention. The ultimate goal is the development of an actionable predictive risk model for first-year retention based on data currently collected and to identify target variables upon which data should be collected to improve future versions of the model. With the development of a predictive risk model and the identification of “at-risk” groups of students it will be possible to coordinate interventions for target populations.

Research Questions

This study is driven by the following research question, which focuses on the early development of an actionable predictive risk mode.

Based on the data currently collected by the institution, which variables (singularly or in combination) correlate with first-year retention?

Role of Researcher

My qualifications for conducting this study are derived from two primary sources, my educational training and my professional work experiences.

First, during my educational training, as a doctoral student at Temple University in the College of Education I have completed extensive coursework in various subjects as well as successfully completed comprehensive assessments that have prepared me to conduct this research. This preparation has provided me with an understanding of both quantitative and qualitative research methods and data analysis, and the ethical considerations and processes for conducting research that is beneficial to both the field of education and to that of the broader society.

Secondly, my professional work experience spans 15-years of management, including 10-years in higher education, 7-years at a four-year institution and 3-years at a two-year institution. I have also been a faculty member in the physical sciences for over 8-years and have been advising students formally or informally for the same. This professional work and direct interaction with students has exposed me to a broad range of experiences that have helped me to develop a strong commitment to student success, including student retention. This experience has also allowed me to build a considerable understanding of the value of engagement on the part of both students and institutional personnel in achieving student retention and, ultimately leading to improved graduation rates.

As a student of higher education, my interests lie in understanding the connections between education, society, the student, and the institution with an emphasis on student engagement and student success. I also hope to better understand the role each plays in, and the impact on how policy is made and enacted. As a practitioner in higher education, my goal is to turn this understanding into actions that will directly impact the students with whom I work. As a leader in higher education, I aspire to bring this knowledge and these actions to the entire institution and broader community to better the success of all students. It is with this mind that I carry out this study.

Definition of Terms

At-Risk is a term used in higher education to identify students or populations that are less likely than the general population to achieve educational goals. Such under-performance, which commonly results in the student not being retained, is often as a consequence of common characteristics that place the student at some disadvantage. These characteristics might include institutionalized discrimination (racial minorities), under-preparation (first-generation students and/or under resourced K-12 schools), or other circumstances that may hamper student progress.

Attrition is a term used in higher education relating to the loss of enrollment of a student or population from the institution from term-to-term or year-to-year; sometimes used as the opposite of retention.

Persistence relates to the continuous enrollment of a student or population at any institution from semester-to-semester, who in principle are making academic progress toward their academic goal.

Retention relates to the continuous enrollment of a student or population at the same institution from semester-to-semester. In the following work, Retention will specifically be defined in terms of Fall-to-Fall continuous enrollment.

CHAPTER 2: LITERATURE REVIEW

General Information

It is well understood that post-secondary education is of value and in demand, viewed by many as a means of socioeconomic upward-mobility. For example, baccalaureate degree holders will on average earn over one million dollars more over their economic lifetime than those who did not attend college (Baum & Ma, 2007). In looking more specifically at the differential in earnings between college completers, non-completers, and non-attenders, Baum and Ma (2007) note a \$250,000 gap in lifetime earnings between those who never attended college versus those who enrolled but did not complete college. The gap between non-completers versus those holding a baccalaureate degree is \$750,000, which is coincidentally also the approximate gap for those holding an associate degree versus a baccalaureate degree (Attewell & Lavin, 2007). College graduates and their families also typically have better general health and increased personal development (Baum & Ma, 2007) and are more likely to propagate their socio-economic improvements on to the next generation (Attewell & Lavin, 2007). Perhaps more poignantly, it is also noted that the disparity in lifetime earnings and propagated socio-economic status is causing the gap between the two groups to widen (Baum & Payea, 2005; Thayer, 2000).

In consideration of the economic and social value of higher education more students and their parents are feeling the pressure to enroll in college despite not always being prepared for the endeavor (Aud, KewalRamani, & Frohlich, 2011; Perna & Thomas, 2006). The graduation rates within 150% of normal time to completion at 4-

year post-secondary institutions has improved slightly from 1996 (55%) through 2006 (59%). However, the 2007 cohort highlights stark differences in graduation rates based on the selectivity of the institution. The 6-year graduation rate for open admission institutions is 34% while that of highly selective institutions, accepting less than 25% of applicants, is 89% (National Center for Education Statistics, 2014). For 2-year post-secondary institutions, the graduation rates within 150% of normal time to completion, has been stable but lower - 2000 (30%) through 2010 (29%). However, there has been some variability based on race and gender. Hispanic females have surged from 32% (2000) to 38% (2010) with Blacks, both male and female, showing slight declines (National Center for Education Statistics, 2014). Bound, Lovenheim, and Turner (2009) in deconstructing the observed changes in the completion rates of two cohorts of high schools students (1972 and 1992) highlighted that institutional characteristics, including institution selectivity and resources spent per student, were more important than student preparedness. Suggesting that rationing and resource management a relevant consideration.

In 2007-08, 44% of first time baccalaureate degree recipients completed their studies within 48 months, another 23% completed within 49-60 months, and 9% completed with 61-72 months (National Center for Education Statistics, 2011). Only 60% are graduating in what was traditionally viewed as the “normal” four-year schedule (Nagda & Zuniga, 2003). Tinto (2012) also highlights that specific areas of study (e.g. engineering) that are demanding or require specifically sequenced coursework may also result in lengthened time-to-graduation and affect retention. Colleges in general and

Community colleges specifically need to take action to either help better prepare students for college or to identify those “at-risk” of not completing college and match them with appropriate interventions to improve retention rates and ultimately bolster graduation rates and reduce the time-to-graduation.

Community Colleges, An historical overview in brief

In the early part of the 20th century increasing global economic competition necessitated a more skilled workforce in the United States. This demand converged with movements by high schools seeking innovative ways to better serve their communities (American Association of Community Colleges, 2012).

During the 1940s and 1950s, the high school-centered “junior colleges” as they were called, started to gain wider acceptance in higher education through the formalization of the associate’s degree, development of job training certificate programs, and legislative changes in how the junior colleges were funded (Robinson-Neal, 2009). As the junior colleges integrated and adapted to the communities they served their reputation as “the college for the community” or as the “Community College” increased (*ibid.*).

The 1960s saw Community colleges embrace their socially-conscious commitment of access to higher education with formalized open-admissions policies, in which the only requirement for admission was a high school diploma or a General Educational Development certificate (GED). The combination of open-admissions policies in conjunction with rapid population growth resulted in the doubling of the number of Community colleges from 412 to 909 in the 1960s and 1970s (Dassance,

2011). There was also a shift in enrollment from four-year colleges to two-year colleges during this time; of the entire U.S. undergraduate population in 1965, only 26% were enrolled in community colleges, by 1992 that percentage had grown to 48% (Robinson-Neal, 2009). The demographics of students attending Community colleges from the 1960s to 1990s had also shifted to include a steadily growing minority population (Lum, 2004) with nearly half of all minorities enrolled at Community colleges (Laden, 2004) and half of all African-American and Hispanic undergraduates students enrolled at Community colleges (Evelyn, 2003).

The noble open-admissions policy of Community colleges has granted greater access to higher education to those who might not otherwise attend college but at the possible cost of lower retention and completion rates relative to more privileged students at selective four-year institutions. Many highly selective private institutions have comparatively higher retention and graduation rates, ironically not as a consequence of institutional actions, but instead to higher per capita resources and their ability to selectively admit students with stronger backgrounds, who are less costly to educate and more likely to succeed (Gold & Albert, 2006). For example, some public universities graduate as little as 30% of their initially enrolled students contrasted with some private institutions graduating up to 90% of their initially enrolled students (National Center for Education Statistics, 2011). This may also be viewed, as highlighted by Bound, Lovenheim, and Turner (2009), as simply as spending per student. Most public universities have less generous spending per student than many private selective institutions.

Community colleges by their very nature appeal to students who often lack the financial means to attend a four-year college, have scheduling constraints due to the need to support themselves or their family, or who are not yet prepared for the traditional college experience (Cohen & Brawer, 2008). As such, they attract a disproportionately higher percentage of at-risk students who may be more costly to educate and receive disproportionately less funding.

Foundational Theories:

Research on college student retention/attrition is extensive with a primary emphasis on pre-college characteristics of students in order to identify the students' "likelihood" to persist and successfully complete college (Astin, 1970, 1984, 1993, 1998, 1999, 2012; Astin, Astin, & Lindholm, 2011; Bean, 1980; Bean & Metzner, 1985; Pascarella, 1985; Pascarella & Terenzini, 1980, 1991; Tinto, 1975, 1987, 1993, 1997, 2012a, 2012b, 2012c, 2013). Some of these scholars as well as subsequent research (Astin, 1993, 1998, 1999, 2012; Astin, Astin, & Lindholm, 2011, Bean, 1980; Bean & Metzner, 1985; Larose, Robertson, Roy & Legault, 1998; Pascarella & Terenzini, 1991; Pribbenow, Phelps, Briggs, & Stern, 1999; Tinto, 1975, 1993, 1997, 2012a, 2012b, 2012c, 2013) suggest that pre-college characteristics and cognitive measures exclusively are inadequate and that a more holistic approach is required. In the following pages a brief overview of some of the earliest and most influential theories and works on student retention/attrition are explored.

Astin's "Theory" of Student Involvement. Although Pascarella and Terenzini (2005) question if Astin's work is a "true theory" as per Kerlinger's (1986) definition, it is

noted that this work was highly influential to the development of subsequent work and included here as a foundational “theory”.

Astin’s early input-environment-outcome (I-E-O) model (1970a, 1970b, 1991) was helpful in the development of his “theory” of student involvement (1984, 1993, 1998, 1999, 2012). The I-E-O model is built on three parameters: inputs, the environment, and outcomes. The “inputs” include the demographic characteristics, family backgrounds, and the academic and social experiences the students bring with them to college. The “environment” is the collective sum of all experiences (academic and social) the student encounters during college both on and off campus. The “outcomes” are the student’s attitudes, beliefs, knowledge, values, and behaviors as a consequence of attending college. Astin asserts that the outcomes are a function of inputs and the environment (Pascarella & Terenzini, 2005). This led Astin to propose a “theory” of student involvement (1984) to explain how students change as a consequence of college. In its simplest form Astin (1984) states that “students learn by becoming involved” (p.133) and provides five postulates which as cited by Pascarella and Terenzini (2005) are as follows:

1. *Involvement Requires Physical and Psychological Energy.* Meaning that a student must make an investment (physical or mental) into an “object”, such as the completion of a task, participation in an activity, or interaction with a person, which may be highly specific (e.g. preparation for a chemistry exam) or generalized (e.g. student college experience).

2. *Involvement is a Continuous Concept.* This postulate states that different students will invest varying amounts of time and energy in different objects at different times throughout their time in college.
3. *Involvement Has Both Quantitative and Qualitative Features.* This postulate notes that a student's investment of energy can vary in quantitative ways (e.g. number of hours spent studying, number of homework problems attempted, etc.) and in qualitative ways (e.g. whether the student retains what was studied, depth in which the student thinks about the subject matter, etc.) and that both are relevant.
4. *Development (or Learning) is Proportional to Quantity and Quality of Involvement.* This postulate states that the overall learning of the student is directly dependent upon the amount and level of involvement. For example, more time spent on an activity with a deeper level of engagement will ultimately result in improved development of the students.
5. *Educational Effectiveness Relates to the Capacity to Increase Involvement.* This postulate states that programs, services, and policies are only able to improve educational effectiveness to the extent that they can increase student involvement.

In later work Astin (1993, 1999, 2012) discusses how outcome predictions could be improved by using both cognitive (knowledge, basic skills and aptitudes, ability to think critically, and overall academic achievement) and non-cognitive (self-concept, attitudes, drive and beliefs which are affective, psychological outcomes that may impact academic

performance in assessable ways) inputs (Astin, 1993, 1999, 2012; Pascarella & Terenzini, 2005).

Tinto's Theory of Individual Departure. Tinto's Theory of Individual Departure (1975, 1987, 1993, 2012a, 2012b, 2012c, 2013) as stated by Pascarella and Terenzini (2005) provides "a more explicit, longitudinal, and interactional model of institutional impact that is similar to Astin's [model] in its underlying dynamics but specifically seeks to explain the college student withdrawal process." (p. 54), and therefore better fits as a true theory. Pascarella and Terenzini (2005) also note that Tinto's theory builds upon the work of Spady's (1971) examination of the role of institutional responsibility in student attrition and is an adaptation of Durkheim's (1951) theory of suicide as an "interactive model of student departure" (Tinto, 1993, p. 112) and is "primarily sociological in character" (Tinto, 1993, p. 113).

Tinto's Theory of Individual Departure as illustrated in *Figure 2.1* theorizes that students enter college with a set of pre-entry characteristics (e.g. family background, skills and abilities, interests, and prior schooling) which collectively form the student's initial disposition toward college including their intentions and level of commitment to collegial and personal goals. As time passes and the student interacts with the structures and members of the academic systems and social systems at the institution their disposition, intentions, and level of commitment are challenged and perhaps modified as a result of these interactions. It is also relevant to note that the institutional academic and social systems are nested within an external environment consisting of family, friends, and other external factors placing demands on the student beyond the

direct college experience. These external factors may also challenge and perhaps augment the student's disposition, intentions, and level of commitment to college ultimately affecting a student's decision to depart college (Pascarella & Terenzini, 2005).

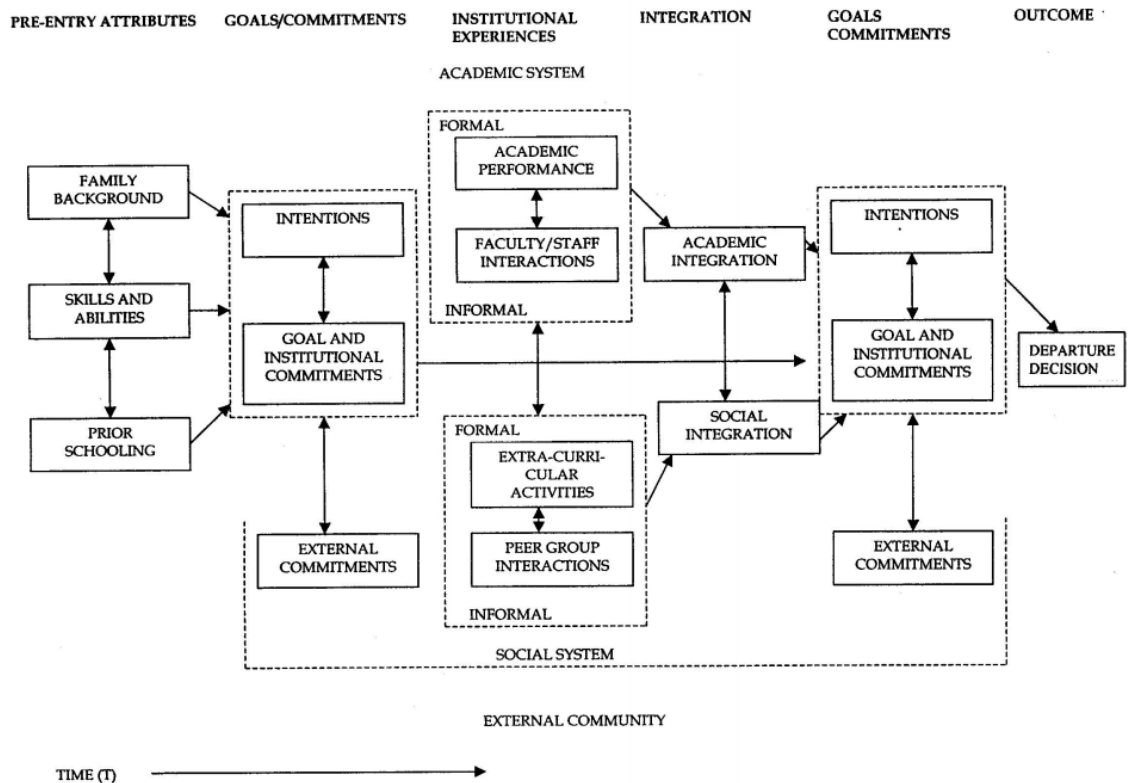


Figure 2.1: Tinto's Theory of Individual Departure – A longitudinal Model of Institutional Departure (Pascarella & Terenzini, 2005)

Based on this model “rewarding encounters” within either the formal or informal academic or social systems would reinforce the system, leading to greater student integration into the systems. For example, such reinforcement would produce a more complete alignment of the student's attitudes and values to that of peers and faculty and in an increased willingness to accept the formal and informal requirements of

membership to the community, and therefore result in a reaffirmation of goals, a deeper commitment to the institution, and improved persistency. Conversely “unrewarding” or “negative encounters” would weaken the system and lead to reduced student integration into the system, diminishing the student’s collegial and personal goals, weakening his or her institutional commitment, and thereby reducing persistency (Pascarella & Terenzini, 2005).

Pascarella and Terenzini (2005) highlight the fact that as a consequence of the unique character of individual institutions as well as the special sub-populations they serve, many scholars call into question the generalizability of academic and social integration concepts (Corman, Barr, & Caputo, 1992), or for specific racial and ethnic minority groups (Attinasi, 1992; Biggs, Torres, & Washington, 1988; Francis & Kelly, 1990; Kraemer, 1997; Murguia, Padilla, & Pavel, 1991; Rendon, Jalomo, & Nora, 2000; Velasquez, 1996), or for adult learner populations (Bills, n.d.; MacKinnion-Slaney, 1994; Spanard, 1990). Pascarella and Terenzini (2005) highlight there is some evidence to suggest that the underlying concepts of academic and social integration operate in substantially the same way for Whites as for minorities to explain student persistence (see Cabrera & Nora, 1994; Cabrera, Nora, Terenzini, Pascarella, & Hagedorn, 1999; Eimers & Pike, 1997; Nora, Cabrera, Hagedorn, & Pascarella, 1996) and that Braxton, Sullivan, and Johnson (1997) have provided a comprehensive examination of the validity of Tinto’s model and there is sufficient generalizability for it to be employed to explain other student outcomes (Pascarella & Terenzini, 2005).

Critique of Tinto's Theory of Individual Departure. Melguizo (2011) on the other hand provides a more critical review of the literature on Tinto's departure model from her guide In Higher education: Handbook of Theory and Research. Melguizo notes that Braxton et al. (1997), states that "Despite weak empirical support for the theory, they still urge the field of higher education to continue using the theory while integrating it with other environmental theories" (p. 400, Melguizo, 2011). Presented below are some of the main criticisms of Tinto's model.

Narrow Integrationalist View. Even as acknowledged by Tinto and other scholars (Stage, 1989; Braxton & Brier, 1989; Brower, 1992; Cabrera, Nora, & Castaneda, 1992) in understanding the process of integration and student engagement at the institutional level this model leaves out many other relevant external factors. Factors such as, articulated K-16 systems, the changes in the financial aid system, the technological changes that affect the way students and faculty interact, as well as dynamic global forces.

Inappropriate for the Study of Minority Retention. Multiple scholars (Attinasi, 1989, 1994; Rendon et al., 2000; Hurtado & Carter, 1997; Tierney, 1991, 1992, 1993) highlight the limitations of Tinto's model for minority students and advocate for a different theoretical model. Kuh & Love (2000) suggest the importance of including a cultural perspective on student departure, emphasizing the fact that the student population of the mid-1970s, when Tinto's theory was formalized, is wholly different from that of the today.

External to Internal Accountability. Melguizo (2011) states that Tinto's model is of great help to college administrators in providing much needed internal accountability. However, without accompanying external accountability or appropriate guidelines, institutions lack a clear set of direction or benchmarks to strive for, other than those that they define for themselves. With appropriate external accountability college administrators could be provide with more focus.

Lack of Instrumentation to Measure Academic and Social Integration. The broad definitions of academic and social integration is problematic in that it does not allow for a systematic means of measure. Instead, each institution defines the terms respective to their own needs and then determines the best way to measure it. Considering the diversity of student populations, institutions, delivery modalities, and other parameters such a tailored approach may work institutionally but limits generalization and broader applicability. With the introduction of the National Survey of Student Engagement (NSSE) and the community college Survey of Student Engagement (CCSSE) some generalized standards are being adopted (Melguizo, 2011). As always, the key will be striking the balance between developing standards that allow for generalization that do not loss all specificity.

Mechanisms Connecting Academic and Social Integration to Learning and Persistence. Bean and Eaton (2001) noted that Tinto's theory does not describe the mechanism that connects the main constructs of academic and social integration to actual learning and persistence. They suggest that non-cognitive characteristics, such a self-efficacy

(Bandura, 1977), coping skills (French et al., 1974), and attribution theory (Rotter, 1966), might help make the connections with learning and persistence (Melguizo, 2011).

Outsourcing Integration to Student Affairs Professionals. Tinto stressed that integration was the responsibility of the faculty [emphasis added] and that student affairs professionals should only be facilitators of that process. However, most institutions outsourced the integration process to student affairs departments as external factors and market pressures altered how institutions operate. Such factors and pressures include a greater research focus at many institutions, drawing faculty into the laboratories or devoting time to grant writing and away from the classroom and teaching. The result is diminished access to the faculty to only perhaps only a small group of research students, who might have improved academic integration but the net loss is reaching fewer students (Melguizo, 2011).

At Odds with the Majority of Open Access and Non-traditional Postsecondary Education Institutions. The reality of the current postsecondary education system is that only a small number of privileged students gain access to private elite and public flagship institutions which typically have greater resources and more narrowly defined missions than broader postsecondary educational system. This leaves the majority of students to open access or otherwise less selective institutions which typically have very broadly defined missions and often have much fewer resources to address those broader missions. With their broad scope and narrow financial base many institutions do not have the needed resources either to have appropriate student-to-faculty ratio to

allow for direct integration or for proper facilitation of the student affairs department, as a result engagement suffers.

Tinto notes that student demographics changed in the mid-1970s and that having traditional students is now more the exception than the norm. Consequently, the model fails to account for the majority of the student population that the higher education system serves (Rendon et al., 2000; Hurtado & Carter, 1997).

In the spirit of Braxton et al. (1997) who states that “Despite weak empirical support for the theory, they still urge the field of higher education to continue using the theory while integrating it with other environmental theories” (p. 400, Melguizo, 2011) along with the understanding that an integrationalist view necessitates a contextualization of the model to the institution (Melguizo, 2011), Tinto’s model is used as a starting point for the early exploration of the risk modeling of first year student retention at two-year colleges. Based on the data currently collected, the performance of the early model, and the feasibility of collecting alternative data, it is expected that the initial risk model will require adjustment to include other environmental theories.

Risk Modeling

Creswell (2012) defines predictive designs, such as predictive risk modeling, as a correlational research design whereby “the investigator identifies variables that will positively predict an outcome or criterion. A prediction permits us to forecast future performance, such as whether a student’s GPA in college can be predicted from his or her high school performance” (p. 358).

The use of risk prediction models in higher education is twofold. First, to efficiently identify students deemed “at-risk” and, second, effectively provide those students with resources and interventions in order to positively influence retention. Risk modeling allows institutions to examine a wide set of variables (including both academic and nonacademic) belonging to a defined historical population. This historical population is generally that of the institution’s student body or a subset thereof, in order to make credible predictions of risk to similarly related future populations (Copas, 1999). It should be stressed that such modeling is constructed from a historical perspective and that assumptions about the future may or may not hold true in general or for subpopulations. Therefore, care must be exercised in its application (Walklate, 1999). This can become an acute concern when considering changes are currently afoot with more traditionally underrepresented populations enrolling in college and shifting demographic characteristics in regards to gender, age, race, and ethnicity (Reason, 2009).

Copas (1999) suggests that logistic regression is the best statistical analysis methodology for examining historical data to then apply to contemporary populations with the aim of determining risk. Specifically, Copas (1999) highlights accuracy, effectiveness, practicality, and the overall soundness of the approach for generating “risk scores”. Copas (1999) goes on to say “the resulting risk scores give an assessment of risk for all possible combinations of values of the risk factors. Without a model, there would never be enough data to assess each of these combinations separately” (p. 38). Therefore, using such a methodology to build a risk model would allow for the

examination of an extensive number of variables and their combinations, in order to improve the reliability and predictability of the model.

Risk Modeling: Cautions

Risk modeling is not a panacea and it is important to consider its limitations when developing or implementing a predictive risk model. There are three primary areas of concern which include context, validity, and expectations.

Context. Risk models must be considered within the context in which they were created. For example, what is the make-up of the underlying population? What are the characteristics of the institution? However, if at all, does the underlying data and historical assumptions relate to the present, to different populations, or to different institutions. Put differently, the unique parameters under which the model was developed may not translate to the new population, different institutions, or even be stable over time.

For example, Reason (2009) in a review of decades of retention literature notes the changing relevance in retention variables and that shifts in student populations are bringing added complexity to predictive risk modeling. Specifically, Reason (2009) states “As an increasing number of students from formerly underrepresented groups come to campus, the effects of race, gender, ethnicity, age, and other demographic variables will change. New studies must reexamine our understanding of these variables and their relationships to retention” (p. 497). Although some, or even all, of these variables may still remain pertinent within the risk model their relative importance may change over time.

As a result, the generalizability of a risk model may be finite. For example, a risk model that provides relatively high predictive power at a large, culturally diverse, public, urban university located in the Middle Atlantic Region of the United States may yield very low predictive power for a small, non-culturally diverse, private, rural, liberal arts college located in the Mid-west. Similarly, a model that was once highly predictive may within a few years become completely non-predictive at the same institution due to underlying changes in the student population or the institution. McGrath and Brainstein (1997) poignantly stress "...college and university administrators and faculty [must] work together to conduct their own research...rather than rely too heavily on findings in the related literature...since every college and university has its own admissions standards and policies" (p. 404).

Validity. The data must be collected in a manner that assures their valid inclusion into the database and ultimate interpretation. Unfortunately, the collection and interpretation of data on human behavior is inherently imprecise. Take, for example, self-reported data as well as multiple sources from which data are collected and eventually aggregated (e.g. admission applications, placement testing, high school transcripts, student questionnaires, etc.). Are requests for data equally understood by all respondents thereby allowing for consistent and objective collection? Are all respondents truthful? Are there inherent biases in wording or collection? Are the conditions under which those data are collected consistent? Do these factors influence the data randomly or systematically? Care must be exercised to assure such factors do not skew the data and ultimately the derived results.

In terms of the aggregation of data, data from multiple sources, and data collected under varying conditions, Copas (1999) notes to an extent there is “a kind of uncertainty principle here - if the data is at the level of detail required, they lack statistical precision, but if they are statistically accurate, they are not sufficiently specific to relate to the circumstance of interest” (p. 36). Therefore, to the extent possible disaggregated data that are collected under uniform conditions that are relevant to the target population should be the goal.

As with any tool, especially one for which precision and validity is required, it must be tested, repeatedly and critically, and calibrated as needed. Should the data or the result be amiss and left unchecked, there is the potential for significant adverse consequences. These adverse consequences might include the loss of substantial resources, financial and human, that are inappropriately deployed or the loss of time by students who were mandated to participate in services that they did not need and perhaps better spent on other pursuits.

Expectations. Predictive risk modeling is simply a tool and as with any tool it has its limitations and appropriate uses. One could, if in dire need, drive a nail with a screwdriver. However, the result of such an action will likely be less than ideal. The same is true with the use and interpretation of risk models.

Within the structured pathways approach Jenkins and Cho (2013) highlight the progression from **Connection** (from interest to enrollment), to **Entry** (from enrollment to program entry), to **Progress** (from program entry to completion of program requirement), to **Completion** (from credential completion to further education/labor

market advancement). Each of these “checkpoints” are valid metrics for tracking student progress. Similarly, Rodicio, Mayer, and Jenkins (2014) point to five important elements each of which could be used as a metric. These include (1) having clear pathways by which to measure student progress. (2) A comprehensive intake process including a holistic assessment of student motivation and metacognitive skills. The intake process should also help student identify and enter a program of study early. (3) Integrated academic and student support services including intrusive coaching and mentoring to help students achieve important pathway milestones. (4) Streamlining developmental education and (5) increase student engagement through communities of interest. With this approach students would benefit from academic, extracurricular, and career activities related to their field of interest, and allow students to engage within a community of other students and faculty with common interests.

Calcagno, Crosta, Bailey, and Jenkins (2007) examined first-time community college students in Florida with regard to enrollment pathways and milestone attainment. They found that key milestone attainment, such as the accumulation of 20 credits or 50% program completion, were more important factors affecting graduation rates of younger students (< 25 years). These scholars also found that a remediation pathway, although negatively affecting graduations rates was less detrimental for older students.

Risk models are limited to the data that are available, making them inherently flawed. Although advocating strongly for the use of statistical modeling in the prediction of risk, Copas (1999) cautions that “the risk score is an attempt to make the

best of what we can find, hopefully in a way that is useful for pragmatic decision making” (p. 48). Ultimately, the use of the risk model must be tempered and used in conjunction with additional sources of “data”, perhaps “data” that is more humanistic and personalized rather than “statistical”.

While perhaps a powerful tool in the identification of students that might be at-risk, a predictive risk model should be but one piece of the retention puzzle. The primary purpose of such a model is to analyze the historical data for a given known population with the goal of predicting the retention or departure of future students. From this critical first step of identification, the hard work actually begins. From here one must determine if it is appropriate to intervene and if so, when and how. If intervention is warranted can it be implemented at scale to be effective in retaining students? It would also be helpful if the intervention is cost effective, can be documented and tracked, and finally fed back into the model in such a way as to clearly identify said intervention with the appropriate population of students. This would allow future students to more easily be matched with a proven and appropriate intervention.

CHAPTER 3: METHODOLOGY

The following chapter focuses on the methods used for this study, the process by which they were carried out, and the rationale for their selection. Other important aspects such as the sample, data sources, and data analysis are also be discussed.

Restatement of Research Question

This study is driven by the following research question, which focuses on the development of a predictive risk model for the institution where the data were collected.

Based on the data currently collected data by the institution, which variables (singularly or in combination) best predict first-year retention?

Population and Data Sources

This study was conducted at a medium sized, suburban, two-year community college located in the mid-Atlantic region. The institution operates from six locations within its two county service region and maintains a policy of open admissions, providing academic excellence to anyone who can benefit from its programs. Program offerings include a variety of levels and areas of focus. These include ten college and university transfer programs with Associates degrees in Arts and Science that articulate directly with local area, four-year institutions (e.g. Engineering, Mathematics, Business, English, etc.). The College also offers 37 career degree programs with Associates in Applied Arts and Science that lead to direct employment in high demand occupations within the region (e.g. information technology, medical coding & billing, nursing,

plumbing, HVAC, etc.) as well as 41 certificate programs related to career placement or advancement (e.g. accounting, information technology, etc.).

As an open admissions institution, the College accepts students with a high school diploma or GED certificate. However, all entering students must document their proficiency in mathematics and English. This is most commonly accomplished by placement testing prior to credit bearing coursework. Some students otherwise demonstrate college-readiness with the transfer of relevant mathematics or English coursework to the College. However, such students are included in this study.

Considering the central questions of this study with an eventual goal of the implementation of an actionable predictive risk model of first year retention, the first step is to identify the variables that most closely correlate with first year retention. This was achieved using an Analysis of Variance (ANOVA) and logistic regression analysis of data currently available from historical admissions data and other historical data collected on first year students. From this historical retrospective the variables that demonstrate the most significant predictive relationship with first year retention can then be applied prospectively to the incoming freshman class.

A request was made to the Institutional Research (IR) office for all relevant data for students for the prior five academic years for which data were available (2009-2013). A total of 58,903 records spanning approximately 130 variables were provided. As an initial analysis, the 130 variables were categorized as being entirely missing, majority missing, indeterminate, redundant, irrelevant, or relevant.

A vast majority of the variable fields provided were for legacy variables that were not captured during the 2009-2013 period or for variables derived from them (e.g. legacy placement examination scores and results, legacy Nelson–Denny testing, etc.). Since every record in the set was missing these data these variables were excluded *a priori*.

There were also several variables for which a significant majority of the records had missing values. Although many of these variables may have been relevant to the specific student in question, their high frequency as missing data required they also excluded *a priori*. Relevant examples of such variables included Marital Status (95% missing), Income (98% missing), Employment Status (98% missing), and Why Choose this College (91% missing).

There were also some variables for which a minority of the records had data but the meaning of the variable was indeterminable. Examples of such variables are StSTAT, and sType.

There were also a significant number of variables that appeared to be captured in multiple ways. For example, student age was reported no less than six different ways including by year of birth (two digit and four digit), categorically (3-bands, 4-bands, and 10-bands), and age at the time of third week reporting. Additional examples include residency status, enrollment status, locality of enrollment, credits enrolled, credits taken, placement results, and residency status. In such cases, redundant variables were eliminated. Decisions were based on obtaining a most complete record set (i.e. fewest missing data) in conjunction with choosing measures that were most relevant to the

research question. For example, with regard to age, the third week age was used since it provided the greatest set of complete data and was a continuous measure.

There were also some variables included in the data set that were not relevant to the research questions which were excluded *a priori*. Examples of such variables include Student ID Number, High School Number, Prior Term Enrolled, Credits Attempted (in prior terms), Credits Earned (in prior terms), Prior Term GPA, and Prior College Attendance.

For the purpose of this study the 130 variables were reduced to the following 22 variables described below. Data collected for this study are from students in the 2009, 2010, 2011, and 2012 entering classes.

Pre-entry Variables:

1. **SEX:** This variable denotes the self-reported gender for the student.
Dichotomous (Male, Female).
2. **AGE:** This variable is the student age at the third week reporting of the Fall term based on the student's date of birth. Continuous.
3. **ETHNIC:** This variable denotes the self-reported ethnicity for the student.
Categorical (African American, Asian, Caucasian, Hispanic, Other). This variable was recoded to incorporate the low frequency responses of American Indian, Hawaiian/Pacific Islander, and Two or More into the category Other.

4. **INFO:** This variable captures the self-reported information about how the student primarily learned about the College. Categorical (From: High school counselor, high school faculty, College print materials, Family or friend, College Employee, College website, Newspaper ads, Radio ads, Other websites).
5. **FIRSTGEN:** This is a derived variable denoting first generational status of the student based upon maternal and paternal education, whereby any higher education beyond high school by either parent denotes non-first-generation. Dichotomous (First Generation, Not First Generation).
6. **MATED:** This variable denotes the self-reported maternal educational attainment. Ordinal (Less than high school diploma, High school, Some college coursework, Associates degree, Bachelor's degree or higher).
7. **PATED:** This variable denotes the self-reported paternal educational attainment. Ordinal (Less than high school diploma, High school, Some college coursework, Associates degree, Bachelor's degree or higher).
8. **LANG:** This variable denotes the primary language spoken at home. Categorical (English, Spanish, Other). This variable was recoded to incorporate the low frequency and unidentified responses of "Category 4", "Category 5", & "Category 6" into the category Other.
9. **ACMATH:** This variable denotes the student's mathematics course placement based upon the results of the AccuPlacer placement examination. Ordinal (Lvl 0: Minimum entry, Lvl 1: Basic mathematics, Lvl 2:

Developmental, Lvl 3: College ready, Lvl 4: College ready (algebra), Lvl 5: Pre-calculus, Lvl 6: Calculus).

10. **ACREAD**: This variable denotes the student's English course placement based upon the results of the AccuPlacer placement examination. Ordinal (Lvl 0: Minimum entry, Lvl 1: Basic mathematics, Lvl 2: Low-Developmental, Lvl 3: High-Developmental, Lvl 4: College ready).
11. **RESID**: This variable denotes if the student resides in a sponsoring or non-sponsoring locality. Tuition for sponsoring localities is discounted. Dichotomous (sponsoring, non-sponsoring). This variable was recoded to incorporate the low frequency responses of Foreign/International, Home Reciprocity, and Out-of-State into Non-sponsoring, which have the same tuition structure.

Motivational Variables:

12. **EDGOAL**: This variable captures the student's self-reported educational goal for attending the institution. Categorical (Improve existing job skill, Prepare for a new job, Transfer, Personal interest). Respondents who denoted Preparation for Retirement were excluded from the sample as this population is irrelevant to the research question.
13. **AccGOAL**: This variable denotes how the student intends to accomplish his or her stated education goal. Ordinal (Take selected courses, Complete certificate, and Complete an Associate's degree).

14. **TRANSOcc**: This variable denotes if the student is enrolled in an academic transfer program or a generally terminal occupational program. Categorical (Transfer, Career, General Studies).
15. **SUBDIV**: This variable denotes the organizational Division of the college in which the student's area of study is housed. Categorical (AH: Allied Health & Nursing; BUS: Business & Computing; CAH: Communications, Arts, & Humanities; PSSS: Public Service & Social Science; STEM: Science, Technology, Engineering, & Mathematics; TECH: Workforce Development & Community Education).

Access Variables:

16. **FINAid**: This variable denotes if the student has used financial aid for any part of the academic year. Dichotomous (Aid, No Aid).
17. **FULLPART**: This is a variable that denotes the Full-time (≥ 12 credits) or Part-time (< 12 credits) status of the student. Dichotomous (Full-time, Part-time).
18. **SESSION**: This variable captures the student's enrollment status as being primarily Day-time or Evening. Dichotomous (Day-time, Evening). This variable was recoded to incorporate the low frequency responses of Weekend into the category Evening.
19. **CAMPUS**: This variable captures the student's enrollment status based on campus location. Dichotomous (Main Campus, Other). This variable was recoded to consolidate multiple low frequency responses into two categories, Main Campus and Non-Main Campus (or Other).

Outcome and Other Variables:

20. **TERM:** This variable denoting the student's entry Fall term year. Ordinal (Fall: 2009, 2010 ,2011, 2012).

21. **GPA:** This variable is the student's end of academic year Grade Point Average. Continuous (4 point scale).

22. **RETAINED:** This variable denotes if the student was retained at the institution the subsequent Fall term. Dichotomous (Retained, Not Retained).

CHAPTER 4: RESULTS

The purpose of this chapter is to present relevant information about the population, sample, and the data analyses employed to answer the research question. There are three sections to this chapter: the first describes the demographics and other characteristics of the research sample; the second reports the analyses and results relevant to the research question; and the third includes regression analyses that were conducted to more fully address the research question.

Demographics and Other Characteristics of the Sample

Presented in Table 4.1 are the frequency and percent values for each variable of the sample. An explanation of the variables and their value descriptions can be found in the methods sections (pg. 35) as well as in the narrative sections of Tables 4.2 and 4.3 (pgs. 44 & 45).

Table 4.1: Demographics and Other Characteristics of the Sample (N = 58,903)

Variable	Freq	Valid %	Variable	Freq	Valid %	Variable	Freq	Valid %
TERM			ETHNIC			EDGOAL		
2009	11673	19.8	Caucas.	36881	62.6	NewJob	16274	27.6
2010	10715	18.2	Af.Am.	14139	24.0	Trans.	16001	27.2
2011	11435	19.4	Other	3514	6.0	Impr.	10254	17.4
2012	12137	20.6	Asian	2489	4.2	Per.Int.	5004	8.5
2013	12943	22.0	Hispanic	1368	2.3			
SEX			SESSION			ACCGOAL		
Female	33045	56.1	Day	41027	69.7	Sel.Crs.	21207	44.0
Male	25858	43.9	Evening	17619	29.9	2YrDeg.	22901	38.9
RESID			CAMPUS			Cert.	4069	8.4
Non-Sp.	25119	42.6	Main	46230	78.5			
Sponsoring	33783	57.4	Other	12673	21.5			
INFO			ACMATH			ACREAD		
Fam./Fri.	17522	40.2	Lvl 0	2536	4.3	Lvl 0	2878	4.9
Web	9661	22.2	Lvl 1	3709	6.3	Lvl 1	3761	6.4
HS.C.	5408	12.4	Lvl 2	13608	23.1	Lvl 2	9903	16.8
Print	413	9.5	Lvl 3	1175	20.0	Lvl 3	5943	10.1
HS.F.	2414	5.5	Lvl 4	8005	13.6	Lvl 4	22048	49.5
EE	2097	4.8	Lvl 5	7600	12.9			
Other	1289	3.0	Lvl 6	1319	2.2			
Paper	846	1.9				GPA: M = 2.938, N = 4088		
Radio	232	0.5				AGE: M = 26.4, N = 58763		
MATED			PATED			FIRSTGEN		
BS	11182	22.9	BS	12505	26.2	Yes	30277	63.3
2Yr	5006	10.2	2Yr	3355	7.0	No	17589	36.7
HS+	9866	20.2	HS+	7636	16.0	FULLPART		
HS	18893	38.6	HS	1922	40.2	Full	23983	40.7
<HS	3963	8.1	<HS	5093	10.7	Part	34920	59.3
SUBDIV			LANG			TRANSOCC		
CAH	15694	27.8	English	46291	93.5	Trans.	34378	58.4
BUS	11517	20.4	Other	2525	5.1	Career	22211	37.1
PSSS	8950	15.8	Spanish	688	1.4	Gen.St.	2312	3.9
AH	8890	15.7	FINANCIAL AID			RETAINED		
STEM	8572	15.2	No	31104	52.8	No	30427	51.7
Tech	2906	5.1	Yes	27799	47.2	Yes	28476	48.3

As shown in Table 4.2 the total sample size is 58,903 students distributed nearly equally over the five year period from 2009 to 2013. The ethnic composition of the sample is predominantly Caucasian (63%) with the next largest group being African American (24%). Students predominantly speak English at home (93%), attend at the main campus (78%), and register for day-time courses (70%). The population is also

slightly skewed toward those attending on a part-time basis (59%), reside in sponsoring school districts (57%), are female (56%), and utilizing financial aid (53%).

In terms of the primary educational goal for attending the college, students equally cited earning transfer credit (27%) and preparation for a new job (27%). The next most cited reason was to improve existing job skills (17%). In terms of how students expected to accomplish their stated goal, most students cited taking selected courses (44%) followed by earning an associate's degree (39%). Students most frequently learned about the college by means of family or friends (40%) followed by the College Website (22%) or their high school councilor (12%).

Mathematics placement testing frequently placed students in high developmental (Lvl 2, 23%) or college ready (Lvl 3, 20%) mathematics courses, whereas Reading/English placement testing frequently placed student predominantly in college ready (Lvl 4, 49%) English courses. The median GPA for the population is 2.938 and the median age is 26.4 years. The largest area of study for students in the population is Liberal Arts (27%) and the smallest is Technical Education (5%) with nearly equal distributions in the other areas.

The maternal educational level most frequently reported was high school graduate (38%) followed by a Bachelor's degree or better (23%). Paternal educational level was similar (HS 40%, BS 26%). First generation status for the population, defined as either parent having attended some college, was 63%. The first-year retention for the sample was 48%.

Analyses and Results Relevant to the Research Question

Presented in Table 4.2 are ANOVA results for the continuous and dichotomous variables in terms of student first-year retention sorted by their partial eta squared values. Within each variable the least retained population is presented first. The narrative summary provides a brief synopsis of the meaning of the ANOVA results. Variables of most interest are usage of financial aid (**FINAID**), attendance patterns being full or part time (**FULLPART**), and registering for daytime or evening/weekend courses (**SESSION**).

Table 4.2: Summary of Retention Statistics for Continuous and Dichotomous Variables

Variable	%Retained (ascending)		η_p^2 (1)	Narrative Summary
FINANCIAL AID	No Aid	43.5%	.011	Students that use Financial Aid are more likely retained (+10.3%) than those students that do not. The effect size is medium. $F(1, 58903) = 634.441, p < .000, \eta_p^2 = .011$
	Aid	53.8%		
FULL PART	Part	44.9%	.007	Students that attend on a full-time basis are more retained (+10.4%) than those attending on a part-time bases. The effect size is very small. $F(1, 58903) = 398.611, p < .000, \eta_p^2 = .007$
	Full	53.3%		
SESSION	Eve	42.6%	.006	Students that attend as Day-time students are more likely retained (+8.3%) than those attending as an Evening or Weekend student. The effect size is very small. $F(1, 58903) = 346.254, p < .000, \eta_p^2 = .006$
	Day	50.9%		
RESID	Non.	45.3%	.003	Students from Sponsoring school districts are more likely retained (+5.3%) than students from Non-Sponsoring districts. The effect size very small. $F(1, 58902) = 162.129, p < .000, \eta_p^2 = .003$
	Spons.	50.6%		
SEX	Male	47.0%	.001	Female students are more likely retained (+2.4%) than male students. The effect size is very small. $F(1, 58903) = 31.507, p < .000, \eta_p^2 = .001$
	Female	49.4%		
FIRSTGEN	Not 1 st	47.7%	.001	First Generation students are more likely retained (+2.0%) than non-First Generation students. The effect size is very small. $F(1, 51539) = 18.888, p < .000, \eta_p^2 = .001$
	1 st Gen	49.7%		
GPA	Not Ret.	M = 2.91	.001	Retained students have slightly higher GPA (+0.05) than non-retained students. The effect size if very small. $F(1, 40988) = 38.121, p < .000, \eta_p^2 = .001$
	Ret.	M = 2.96		
AGE	Not Ret.	M = 26.69	.001	Retained students are slightly younger (-0.6 years or -7.2 months) than non-retained students. The effect size if very small. $F(1, 58761) = 60.795, p < .000, \eta_p^2 = .001$
	Ret.	M = 26.09		
CAMPUS	Main	48.2%	.000, p=.098	There is no significant difference between students denoted as being enrolled at the main campus or at a branch campus. $F(1, 58903) = 2.732, p < .098, \eta_p^2 = .000$
	Other	49.0%		

(1) Partial Eta Squared values are at $p < .000$ unless otherwise noted.

Presented in Table 4.3 are ANOVA results for the categorical and ordinal variables in terms of student first-year retention sorted by their partial eta squared values. Within each variable the least retained population is presented first. The narrative summary provides a brief synopsis of the meaning of the ANOVA results. Variables of most interest are the student's stated academic goal for attending the

college (**AccGOAL**), and the student’s maternal/paternal educational attainment level (**MATED** and **PATED**).

Table 4.3: Summary of Retention Statistics for Categorical and Ordinal Variables

Variable	%Retained (ascending)	η_p^2 (1)	Narrative Summary
AccGOAL	Cert. 39.9% Sel.Crs. 44.9% 2YrDeg. 53.2%	.009	This variable denotes how the students will accomplish their stated educational goal. Students denoting the means by which they plan to attain their education goal by earning a Certificate are less retained (-13.3%) than those denoting Selected Coursework (-8.3%) than those denoting attainment of a Two-Year Associates Degree. The effect size is small. $F(2, 48,177) = 218.638, p < .000, \eta_p^2 = .009$
SUBDIV	Tech 40.2% CAH 44.7% PSSS 49.0% BUS 49.4% AH 51.3% STEM 52.3%	.004	This variables denotes that Division in which the student’s area of study is housed. Student studying in the Technical Education area are least retained (-12.1%) than students studying Communications, Arts, or Humanities (-7.6%), than those studying in the areas of Social Science, Business, Allied Health or STEM fields. The effect size is very small. $F(5, 56,529) = 50.167, p < .000, \eta_p^2 = .004$
INFO	Other 41.1% Radio 44.0% Paper 44.4% Web 45.1% EE 48.3% F/F 49.8% Print 50.2% HS.F. 51.4% HS.C. 52.1%	.003	This variable denoting the student’s primary source of information about the college. Students that learn about the college from Other Internet Sources, Radio and Newspaper Ads, and the College Website are less retained than those who learn about the college from a College Employee, Family or Friends, Printed Materials, High School Faculty, or High School Counselors. The effect size is very small. $F(8, 43,608) = 16.382, p < .000, \eta_p^2 = .003$
ACMATH	Lvl 0 40.9% 5 48.4% 1 49.1% 6 50.0% 4 50.9% 3 52.2% 2 52.4%	.003	This variable denoting the student’s mathematics course placement based on the AccuPlacer exam. Students that are placed at Lvl 0 (Minimum Entry) are least likely retained (-11.5%), followed by student that place at Lvl 1, 5, & 6 (Low-Developmental, Pre-Calculus, & Calculus), followed by student that place at Lvs 2, 3, 4 (High-Developmental & College Level). The effect size is very small. $F(6, 48529) = 23.913, p < .000, \eta_p^2 = .003$
ACREAD	Lvl 0 44.1% 1 43.6% 4 50.1% 3 51.2% 2 51.9%	.003	This variable denoting the student’s English course placement based on the AccuPlacer exam. Students that place at Lvl 0 & 1 (Minimum Entry & Low-Developmental) are least retained followed by students placing Lvl 2, 3, & 4 (High-Developmental & College Level). The effect size is very small. $F(4, 44,533) = 29.981, p < .000, \eta_p^2 = .003$

Table 4.3: Summary of Retention Statistics for Categorical and Ordinal Variables (*continued*)

Variable	%Retained (ascending)		η_p^2 (1)	Narrative Summary
TERM	2013	45.3%	.002	This variable denoting the student's entry Fall term year. There was a substantial uptick in student retention (+5.1%) from 2009 to 2010 with a steady decline (approx. -2.2%/year) into 2011, 2012, & 2013. The effect size is very small. $F(4, 58903) = 33.400, p < .000, \eta_p^2 = .002$
	2009	47.1%		
	2012	47.8%		
	2011	50.0%		
	2010	52.2%		
EDGOAL	Trans.	45.8%	.002	This variable denoting the student's stated Educational Goal. Students that declared their goal to be to Transfer were less likely retained (-3.6%) than those who declared their goal as being to Improving an Existing Skill, Personal Interest, or Preparation for a New Job. The effect size is very small. $F(3, 47,533) = 25.839, p < .000, \eta_p^2 = .002$
	Impr.	49.4%		
	Per.Int.	49.4%		
	NewJob	50.6%		
MATeD	BS	45.8%	.001	This variable denoting the student's Maternal Educational Level. Students with a Maternal Educational of Bachelors or Higher (BS) or a Two-year Degree (2Yr) are less retained than students with Maternal Education of Some College but No Degree (HS+), High School or GED (HS), or Less Than a High School Degree. The effect size is very small. This is contrary to what is expected. $F(4, 48,910) = 16.690, p < .000, \eta_p^2 = .001$
	2Yr	47.7%		
	HS+	47.7%		
	HS	49.8%		
	<HS	51.7%		
PATeD	BS	45.7%	.001	This variable denoting the student's Paternal Educational Level. Students with a Paternal Educational of Bachelors or Higher (BS) are less retained than those with Paternal Education of a Two-year Degree (2Yr), Some College but No Degree (HS+), High School or GED (HS), or Less Than a High School Degree. The effect size is very small. This is contrary to what is expected. $F(4, 47,818) = 12.357, p < .000, \eta_p^2 = .001$
	2Yr	49.2%		
	HS+	49%		
	HS	49%		
	<HS	50.0%		
ETHNIC	Cauc.	47.5%	.001	This variable denotes the student self-reported Ethnicity. Students identifying a Caucasian and African American are less retained than those identifying as Other, Hispanic, or Asian. The effect size is very small. $F(4, 58,386) = 12.997, p < .000, \eta_p^2 = .001$
	Af.Am.	48.8%		
	Other	50.5%		
	Hisp.	51.6%		
	Asian	53.7%		
LANG	English	48.1%	.001	This variables denotes the primary language that is spoken at home. Students that primarily speak English and Spanish at home are less retained than those primary speaking Other languages at home. The effect size is very small. $F(2, 49,504) = 18.882, p < .000, \eta_p^2 = .001$
	Spanish	51.6%		
	Other	54.3%		
TRANSOcc	Gen.St.	41.7%	.001	This variables denotes if the student is enrolled in an academic transfer program or a generally terminal occupational program. Student denoted as General Studies are less retained than those denoted as Transfer or Career/Occupational. The effect size is very small. $F(2, 21.75589013) = 21.753, p < .000, \eta_p^2 = .001$
	Trans.	48.4%		
	Career	48.9%		

(1) Partial Eta Squared values are at $p < .000$ unless otherwise noted.

Presented in Table 4.4 are all of the variables sorted by their partial eta squared values.

Table 4.4: Independent Variables Sorted (descending) by Effect Size on First-Year Retention

Variable	η_p^2 (1)	Variable	η_p^2 (1)	Variable	η_p^2 (1)
FINANCIAL AID	.011	ACMATH	.003	MATED	.001
AccGOAL	.009	ACREAD	.003	PATED	.001
FULL PART	.007	TERM	.002	ETHNIC	.001
SESSION	.006	EDGOAL	.002	LANG	.001
SUBDIV	.004	SEX	.001	GPA	.001
INFO	.003	FIRSTGEN	.001	AGE	.001
RESID	.003	TRANSOCC	.001	CAMPUS	.000, p = .098

(1) Partial Eta Squared values are at $p < .000$ unless otherwise noted.

The combined partial eta squared values (Table 4.4) suggest that the most relevant variables are usage of financial aid (**FINAID**), the stated academic goal for attending the college (**AccGOAL**), attendance patterns being full or part time (**FULLPART**) and registering for daytime or evening/weekend courses (**SESSION**). Additional variables that may of interest include, the organizational subdivision of the college in which the student’s major is housed (**SUBDIV**), the primary source of information by which the student learned about the college (**INFO**), the student’s residency status as being from a participating or non-participating school district (**RESID**) and the student’s mathematical (**ACMATH**) and English (**ACREAD**) AccuPlacer examination placement results.

Regression Analysis

The recommended regression analysis for a dichotomous dependent variable is a binary logistic regression (Copas, 1999; Long & Freese, 2006). However, due to limitations in the data collection and sample available a significant number of records contain missing data. A closer review of the missing data revealed that they were not

missing at random. The software available was only able to run a logistic listwise deletion regression which resulted in a substantial sample reduction (N = 58,903 to N = 17,447), a loss of over 70%. Since the study was designed with this analysis in mind, it was decided to run regression analyses two different ways as exploratory analyses. The first set of results are from a binary logistic regression using listwise deletion. The results for this analysis are presented in Table 4.5. As an additional analysis, an Ordinary Least Square linear regression using pairwise deletion was also run, which resulted in a slightly smaller sample reduction (N = 58,903 to N = 30,432), a loss of about half. The results for this linear regression are presented in Table 4.6. In order to run this analysis some of the categorical variables (e.g. **AccGOAL**, **SUBDIV**, **EDGOAL**, **LANG**, and **ETHNIC**) were either recoded as dichotomies based on the post hoc test or appropriate records were eliminated from the analysis if their populations were very small. For both regressions, a stepwise procedure was used to make the results more interpretable.

Table 4.5: Logistic Listwise Stepwise Regression for First-Year Retention (N = 17,447)

Step	Variable	Adj. R ²	Step	Variable	Adj. R ²	Step	Variable	Adj. R ²
1	FIN AID	.010	5	RESID	.025	9	SUBDIV	.034
2	EDGOAL	.016	6	GPA	.028	10	ETHNIC	.035
3	FULL PART	.020	7	TERM	.031	11	ACMATH	.036
4	SESSION	.023	8	CAMPUS	.033			

Table 4.6: Linear Pairwise Stepwise Regression for First-Year Retention (N = 30,432)

Step	Variable	Adj. R ²	Step	Variable	Adj. R ²	Step	Variable	Adj. R ²
1	FIN AID	.011	6	GPA	.027	11	TERM	.031
2	AccGOAL*	.016	7	SUBDIV*	.029	12	CAMPUS	.031
3	FULL PART	.021	8	EDGOAL*	.029	13	AGE	.032
4	RESID	.023	9	LANG*	.030	14	ETHNIC*	.032
5	SESSION	.025	10	ACREAD	.030	15	MATED	.032

* Variables recoded as dichotomies based on post hoc test and/or very small populations eliminated.

Substantively the results of the logistic regression and the Ordinary Least Square (OLS) regression are in agreement with each other and with the ANOVA analyses,

suggesting that the variables of most interest are usage of financial aid (**FINAID**), attendance patterns being full or part time (**FULLPART**), registering for daytime or evening/weekend courses (**SESSION**), the stated academic goal for attending the college (**AccGOAL**), and perhaps whether or not the students reside in a sponsoring or non-sponsoring school district (**RESID**). These variables essentially represent the first five entries in the stepwise regressions of both models. The variables **EDGOAL** and **AccGOAL** are measures of the reason for attending and the means by which to attain that goal, respectively, and are therefore similar and related. Some of the additional variables entering both regressions in latter steps include, the student's end of year GPA (**GPA**), the term cohort to which the student belongs (**TERM**), the attendance patterns of the students as being at the main campus or a branch campus (**CAMPUS**), of the organizational subdivision of the college in which the student's major is housed (**SUBDIV**), and the ethnicity of the student (**ETHNIC**). Noticeable difference between the models are the logistic model including mathematical placement (**ACMATH**) whereas the OLS model includes English placement (**ACREAD**), the student's age (**AGE**), and maternal educational attainment (**MATED**).

The agreement between the logistic and OLS models is not entirely unexpected. Hellevik (2009 & 2013) notes that in many situations OLS and logistic models give results that are practically indistinguishable except that the logistic model is typically less intuitive and more difficult to interpret. Other researchers note that when the portability for the dependent variable is expected to be between 0.20 and 0.80 the log odds are essentially a linear function of the probability and the two models are expected

to yield similar results (Long, 1997; Long & Freese, 2006). Since the results of the two methods are substantively similar, the smaller losses of the sample, and ease of interpretation, the OLS regression model will be used for discussion purposes.

CHAPTER 5: DISCUSSION

Presented in this chapter is a summary of findings from the ANOVA and regression analyses, a discussion of those findings and their possible implications. Additionally, limitations of this study, areas of future work, and conclusions will be presented.

Summary of Findings

The purpose of this study was to explore the possibility of developing a predictive risk model utilizing data that are currently being collected by the institution. In a general sense, it appears that such a risk model is not predictively powerful. The logistic regression model explains only 3.6% of the variability and the ordinary least squares (OLS) model only 3.2%. Therefore, at this time implementation of a predictive risk model is not practical. However, the relative ordering of variable importance among the ANOVA analyses and both regression methodologies are substantively similar and may help highlight relevant variables that should be included in future attempts in risk model development. Presented below are some of the highlights of important or otherwise interesting findings.

Discussion of Findings

FINAid: The student's use of financial aid, measured as using financial aid (54%) or not using financial aid (44%), was the strongest predictor of first-year retention. The partial eta squared was .011, $p < .000$ in the ANOVA analysis and it entered in the first step of both the logistic and OLS regressions.

In interpreting these results, they help to confirm what is perhaps already understood: that the financing of one's education is a hurdle to retention. Considering the higher proportion of economically disadvantaged and first generation students attending community colleges this is not a surprising result. In this case it is assumed that there is a causal relationship, meaning that students paying more out of pocket for tuition and books are less likely to remain in school; therefore increasing the number of students taking advantage of financial aid opportunities should positively impact student retention.

As an access variable, an area of opportunity for the college would be to increase the number of students taking advantage of financial aid. This could be accomplished by (1) increasing awareness of the availability of financial aid – to get more students to apply, (2) streamlining the process of applying for financial aid – to get more students to complete the process, and (3) maintaining a connection with students who otherwise disengage from the process. – These steps might recapture those that might become overwhelmed or confused, be randomly selected for audit, or get discouraged with the lengthy and complex process.

AccGOAL: The means by which students plan to accomplish their educational goals, which is measured as being “to graduate with a two-year Associate’s degree” (53%), “take selected coursework” (45%), or “complete a certificate program” (40%) was the second strongest predictor of first-year student retention. The partial eta squared was .009, $p < .000$ in the ANOVA analysis and it entered in the second step of the OLS regression and eighth in the logistic regression.

In interpreting these results it is logical that students who are initially motivated to complete a two-year Associate's degree are the most likely to be retained. However, it is curious that students denoting a certificate program as their motivating factor are less retained than those just taking selected coursework. It is perhaps because students who are taking "selected coursework" are in fact doing so with the "hidden" intention to transfer, and therefore complete a four-year degree which may be a stronger motivating factor for retention.

As a motivational measure this variable may be a helpful predictor of the students' intentions to be retained during their first-year. However, the low predictive power of the variable as well as the high degree to which data were missing (10,726 records missing, or 18% of the sample) would suggest refinement is needed in how the data are collected. In addition, due to the peculiarity of "taking selected courses" being relatively high perhaps how the results are coded may also be important to consider. For example, perhaps capturing data such as, "to complete selected coursework..." "...for transfer", "...for personal interest", "...for employment and/or advancement", etc. would provide more usable results.

The college also offers a substantial number of certificate programs. With such programs exhibiting lower retention results, it may be important to dig deeper into this finding and perhaps on a program-by-program basis to better understand the result.

An area of opportunity for the college might be to recruit students who denote their accomplishment goal as being to earn a two-year Associate's degree or, assuming a causal relationship can be confirmed, to work with students denoting otherwise to

commit to such a goal. For students in certificate programs, support and monitoring systems, as well as general academic planning and personal work-life-school balancing programs may prove helpful.

FULLPART: The enrollment status of the student as being either full-time (≥ 12 credits) or part-time (< 12 credits) was the third strongest variable. Full-time students are more likely to be retained (53%) than part-time students (45%). The partial eta squared was .007, $p < .000$ in the ANOVA analysis and it entered in the third step in both regressions.

In interpreting these results, this variable is viewed primarily as an access variable in terms of the students' ability to devote both time and financial resources to their studies on a full-time basis but could also be viewed as a motivational variable in terms of their commitment to their studies. As an access variable it may be directly related to the use of financial aid. Also of interest in exploring the meaning and impact of this variable would be the student's employment status and household income, both of which are collected by the institution but have inordinately high missing data rates (both 98% missing). Additionally, the student's number of hours worked per week could also be helpful.

The area of opportunity for the college would be encourage and facilitate more students being able to attend as a full-time student. The current trend from 2009 to 2013 has been toward students attending more and more on a part-time basis increasing from 54% to 63%. In situations where full-time enrollment would be impossible, the college should explore, as best it can, the reasons why part-time

students are unable or unwilling to continue their studies. Additionally, variables related to income and employment may be relevant and should be collected in such a way as to ensure higher response rates.

SESSION: The enrollment pattern of students in terms of primarily taking courses during the day compared to evening/weekend courses was the fourth strongest predictor. Day-time students are more likely to be retained (51%) over evening/weekend students (42%). The partial eta squared was .006, $p < .000$ in the ANOVA analysis and it entered in the fourth and fifth steps in logistic and OLS regressions respectively.

The session variable is viewed primarily as an access variable based on a student's limited ability to attend classes during the day (i.e. the student may be working during the day). This variable is heavily related to the preceding full-time/part-time variable as most students who attend evening/weekend courses do so on part-time basis. In this sample 90% of the students attending evening/weekend courses were also part-time students. Of those attending during the day, 46% of the students were part-time.

The area of opportunity for the college, similar to the preceding variable, would be to encourage and facilitate more students being able to attend day-time courses. In situations where day-time enrollment would be impossible, the college should explore, as best it can, the reasons why evening students are unable or unwilling to continue their studies.

RESID: The students' residency status, denoting if they live in a sponsoring or non-sponsoring school district, was the fifth strongest predictor. The sponsoring status is also indicative of the tuition charged to the student such that sponsoring students receive a significant discount. It was found that sponsoring students were more retained (51%) than non-sponsoring students (45%). The partial eta squared was .003, $p < .000$ in the ANOVA analysis and it entered in the fifth and fourth steps in logistic and OLS regressions respectively.

Due to its relationship to tuition this variable can be viewed as an access variable. The predicative power of this variable is very weak but its relative importance to the other variables may be helpful in framing future work. It may also be helping reinforce the factors such a cost as a predominant factor.

MATED/PATED: Maternal and paternal educational attainment showed very weak predictive power, the partial eta squared values were both .001, $p < .000$ in the ANOVA analysis and only maternal educational attainment appeared in the 15th steps of the OLS regressions and did not appear in the logistic regression. It is included here because of a peculiarity found in the ANOVA analysis. For both maternal and paternal educational attainment, higher educational attainment (Baccalaureate or better, 46%) had lowest retention whereas the lowest educational attainment (less than a high school diploma, MATED, 52% PATED, 50%) had higher retention, contrary to what would be expected.

In interpreting these data, students with higher parental educational attainment (specifically maternal educational attainment) also primarily denoted their **AccGOAL** as taking only "selected coursework" at the college (51%) perhaps for just a partial year

before transferring to a four-year institution. Only 39% in the highest maternal educational attainment category denoted a “two-year degree” as their goal. A majority of these students would be counted as not retained in this system although they had fulfilled their personal educational goal and transferred without returning to the college the following year. Conversely, students with lower maternal educational attainment are more likely to utilize financial aid (61%) versus those with the highest maternal educational attainment (33%) and are least likely to speak English at home (73%) compared to all other maternal educational attainment categories (all approximately 95%). Although speculative, it is possible that students from this lowest maternal educational attainment have sufficient family-social support systems in place to support their retention.

The opportunity here may be multi-faceted. Firstly, students with higher parental educational attainment could be encouraged to continue their studies at the college into the second year rather than to transfer early. Secondly, after confirming the aforementioned speculations, the college could conduct outreach to populations fitting these characteristics; for example, immigrant populations that may place a higher value on higher education for the next generation. Areas that immediately come to mind include the college’s own English as a Second Language programs and other related non-credit and community support programs.

Implications

The specific purpose of this study was to explore the ability to construct a risk model from the data currently available. It is clear that current data and their means of

collection would be inadequate to construct a meaningful risk model. However, in general terms, this study may help to better understand the application of theory to practice as well as inform policy development and guide future exploration of a risk model. This section will consider the outcomes (and shortcomings) of this research in order to make policy recommendations that are supported by the empirical evidence available with the goal to more efficiently apply limited resources to maximum effect to improve student first-year retention and improve the predictive power of future risk models.

This section is divided into the following two main areas: general recommendations and additional relevant theories and variables. The general recommendations relate to continuation of the research, data collection considerations, and inclusion of qualitative elements from the advising office. The section focusing on additional relevant theories and variables highlights nine additional theories or conceptual areas that would likely be helpful either in the development of a more powerful predictive model, should this work be advanced, or otherwise be informative to understanding student departure should a smaller scale approach be taken. These nine additional theories or conceptual areas include Attribution Theory, Academic Preparation, Academic Engagement, Social Engagement, Financing College, Academic Self-Concept, Goal-setting Theory, Motivational Orientation, and Personality Traits.

General Recommendations.

Continue exploration. The predictive power of the risk model that can be constructed from the data currently available is very limited and not worth

implementing. The institution will need to examine its resources and priorities to determine how best to proceed. In the current environment of data driven decision making, it makes sense to continue to explore and collect data from multiple sources on multiple variables in such a way to inform and support decision making and policy development. This, however, will need to be weighed against costs and challenges of collecting such data.

With this in mind it is recommended that, even if only in a limited way, the institution continues to explore risk modeling from the context of the recommendations provided below on data that it can reasonably and reliably collect.

Data Collection: systemization and institutionalization. It would be ideal if the process of data collection and validation was better integrated into the way the college operates. At the moment, it appears that most of the data are collected at the point of application and that many questions (and therefore variables) are optional, leading to high non-response rates for some variables. Some data may (or may not) be updated periodically during the student's studies in a passive way (e.g. change of major). Additionally, there are variables (e.g. employment status, educational goals, etc.) that are collected only at the time of application that may very well change during the student's course of study.

It is, therefore, important that the data collection process somehow be systematized and institutionalized in a way that (1) all employees, especially front line employees, can help facilitate the collection of relevant and valid data, (2) there be a mechanism for enforced review of variables that are most likely to change over time

(e.g. major, employment status, educational goals, etc.), and (3) the process be electronic and automated as much as possible. Examples of such changes might include the following. The college portal system could be integrated with the data base such that periodically students will be prompted to either confirm information that may be temporal (e.g. major, employment status, educational goals, etc.) or provide data that are otherwise missing. Additionally, if data validity is known to be problematic, this process could also be used to confirm responses already contained in the database.

It is unclear, if, how, or at what cost, such an integration could be achieved but additional benefits might also be realized from such a system. For example, soliciting additional information from students on a periodic basis and providing relevant and timely feedback to students may help modulate their behavior. For example, upon enrollment a “graduation date” can be prescribed for the students based on either full-time or part-time enrollment, perhaps with suggested course offerings based on their major and current course completion record. Such feedback might help to shepherd students through their studies or identify those needing guidance or support. Similarly, should students take courses outside of their major, appropriate timely (i.e. at time of registration) feedback could be provided to confirm if the student has unofficially changed his or her major or is confused about the applicability of the selected course to the program.

Integration with advising. The numerical data can only carry the institution so far. It may, therefore, be warranted to formally collect qualitative data related to the reasons why, in general or specifically, students (or subpopulations) are unable or

unwilling to proceed with their studies. The collection and analysis of such qualitative data may, however, be problematic. The advising operations at the institution are large, distributed among multiple locations, and handled by multiple employee populations (e.g. formally by full-time and part-time counselors, full-time and part-time academic advisors, full-time faculty, and administrators, and informally by all of the above plus part-time faculty). It will, therefore, be imperative to proceed with a clear, systemic protocol perhaps focusing on relatively simple issues and using a small, hand selected group of personnel to build up institutional expertise and confidence in the process. Based on the outcomes of these early projects additional, more complex, issues can then be addressed.

It is also possible that employees from the advising area may be working on advanced degrees and could perhaps focus their dissertations or theses on these matters to help explore relevant issues further. Supervisors in the advising area should be made aware of these possible goals and encourage appropriate collaborations.

Additional Theories & Variables. The following section highlights nine additional theories or conceptual areas that would be helpful for future work either in terms of a predictive risk model or more in general to understand student departure should a smaller scale approach be taken.

Attribution Theory. Attribution theory was first introduced as a psychological concept by Fritz Heider (1958) and later refined by Weiner (1979, 1985, 1990, 2000) as an intrapersonal theory of motivation by which people attempt to understand the behavior of others by how they attribute feelings, beliefs, intentions, and meaning to

their actions. The most common factors affecting attributions relating to academic achievement are ability, effort, task difficulty, and luck (Weiner, 1985). Attributions are viewed along three dimensions: Stability, Locus of Control, and Controllability (Weiner, 1990). Stability is a measure of how dynamic a perceived cause is overtime which may be stable or unstable. Locus of Control is the degree to which the perceived cause is viewed as being internal or external to the observer. Controllability is the measure to which observers believe they have control over the cause or the ability to alter its outcome (Linnenbrink & Pintrich, 2002). For example, students might attribute their poor performance on an examination to lack of ability (stable, internal, uncontrollable), being ill at the time of the examination (unstable, internal, uncontrollable), lack of studying (unstable, internal, controllable), or poor instruction (stable/unstable, external, uncontrollable). As one might expect, students are more likely to attempt and persist at an effort that they attribute as having a Stability that is stable and ideally of low difficulty, a Locus of Control that is internal, and a Controllability that is controllable (Schunk & Zimmerman, 2006). It would, therefore, be advantageous to attempt to create environments in which students ascribe such attribution dimensions to their college experience and identify when those attribution dimensions are out of alignment.

The dimensions of Controllability and Locus have shown the ability to produce strong emotional reactions. For example, if students attribute failure to an internal locus and/or to factors beyond their control they may express anger, frustration, shame or hopelessness (Anderman & Wolters, 2006). Students experiencing success who attribute that success to an internal locus and/or factors within their control may

experience great pride and improved self-esteem (Weiner, 2000). The dimension of Stability can also influence students' anxiety with their studies; a stable predictable environment leads to reduced anxiety whereas an unstable unpredictable environment might exacerbate anxiety (Anderman & Wolters, 2006). It is the collective sum of the emotional experiences from prior learning encounters that influence the future choices of the student; a student who experienced shame or feelings of hopelessness in a math course is more likely to avoid future math courses whereas a student who experienced pride is more willing to persist (ibid.).

Understanding how college students attribute their success or failure to their academic work will better help understand their motivations and goals to persist and graduate from college (Stage & Grade, 1999).

Kallenbach and Zaft (2004) suggest that attributional retraining is possible when working with college students and provide four suggestions to positively affect change. These four suggestions include: (1) modeling in which faculty or advisors share personal experiences whereby their thinking and ability level have changed over time; (2) Student modeling, which is similar to modeling in which student leaders or peers share personal experiences whereby their thinking and ability level have changed over time; (3) Analyzing successes where focusing on past successes is used to leverage strengths versus dwelling on weaknesses is emphasized; and, (4) Lastly students are exposed to programs that teach and encourage to practice techniques to enhance student self-control.

Factors relating to attributional disposition and prior experiences will likely be important and should be considered for inclusion in risk modeling where available.

Academic Preparation. Numerous scholars cite poor academic preparation as one of the primary barriers for student retention (Adelman, 1999; Astin 1970a, 1970b, 1984, 1991, 1993, 1998, 1999, 2012; Astin, Astin, & Lindholm, 2011; Bean, 1980; May, 1923; Spady, 1971; Stanley, 1971; Tinto 1975, 1987, 1993, 2012a, 2012b, 2012c, 2013) noting that poor preparation in college level reading, writing and/or mathematics requires students to play “catch-up” in their critical first semester or year with remedial coursework instead of integrating into the campus culture and connecting with peers and faculty, consequently increasing the likelihood of premature departure (Swail, 2004).

One of the primary functions of college admissions offices at selective enrollment institutions is to “predict” the academic viability of applicants and to provide entry only to those who have the best chance of success at the institution (Swail, 2004). Typical admissions data used in the screening process consist of two predictors: (1) high school performance measures, commonly high school GPA and/or class ranking, and (2) college admissions or placement testing scores, generally SAT, ACT, or internal college placement examinations. Of the two parameters high school GPA is typically a better predictor of retention (Adelman, 1999; Astin, 1993; Noftle & Robins, 2007; Stanley, 1971).

It should, however, be stated that there are documented inconsistencies with some of these parameters among various sub-populations including first-generation

college students and minorities (Astin, 1971, 1993, 1998, 1999, 2012; Astin, Astin, & Lindholm, 2011; Freedle, 2003; Naumann, Bandalos & Gutlin, 2003; Zwick & Sklar, 2005) as well as students exposed to non-traditional curricula in high school (Pribbenow, Phelps, Briggs, & Stern, 1999). Several scholars (Astin, 1993, 1998, 1999, 2012; Astin, Astin, & Lindholm, 2011; Larose, Robertson, Roy & Legault, 1998; Pribbenow et al., 1999; Tinto, 1993, 2012a, 2012b, 2012c) stress that cognitive ability alone only accounts for a fraction of the variability in academic achievement. For example, Pribbenow et al. (1999), state "...empirical estimates of predictive validity have revealed that, taken together, high school GPA and standardized test scores explain somewhere between 25 and 45% of the variance in freshman year college grades" (p. 3), strongly suggesting that the use of non-cognitive measures could enhance the college admissions process.

Academic Engagement. Astin (1970a, 1970b, 1984, 1991, 1993, 1998, 1999, 2012) and Tinto (1975, 1987, 1993, 2012a, 2012b, 2012c, 2013) both stress that academic engagement throughout college is integral to success. Tinto (2000) describes the college classrooms as the heart of the institution and the place where students from different peer groups are engaged in the core institutional missions: knowledge attainment. Tinto (2000, 2012c, 2013), however, argues that most college classrooms are simply not engaging, especially those in the first two years of the college experience where "one-directional lecturing" dominates as the primary instructional modality (Fischer & Grant, 1983; Fassigner, 1995) limiting direct student participation and engagement (Karp & Yoels, 1976; Nunn, 1996; Smith, 1983).

It has been documented that academic engagement such as faculty-student interactions both in and out of the classroom as well as the utilization of academic support resources such as learning centers, tutorials, and office hours all positively impact retention (Habley, 2004; Wyckoff, 1998). If academic supports are linked to the everyday learning in the classroom, students are far more likely to utilize these services and consequently be more likely retained and succeed in college (Tinto, 2004, 2012a, 2012b). With this in mind, it is also relevant to note that part-time students are less likely than their full-time peers to have the opportunity to take full advantage of these academic support services and may be an adverse contributing factor to their reduced retention and graduation rates (Adelman, 1999; Habley, 2004).

Academic progress as a whole is also a strong predictor of retention and graduation with factors such as changing majors, retaking required courses, and academic probation or other academic progress warnings all adversely contributing to academic engagement (Demetriou & Schmitz-Sciborski, 2011). Such factors should also be considered for inclusion in risk modeling where available.

Social Engagement. Astin (1970a, 1970b, 1984, 1991, 1993, 1998, 1999, 2012) and Tinto (1975, 1987, 1993, 2012a, 2012b, 2012c, 2013) both also stress that social engagement throughout college is integral to success. Astin (1984) points to expanded college orientation, extracurricular activities, and student-faculty contact both inside and outside the classroom as important in retention. Tinto (1993) highlights that the more students interact with faculty and staff, in any capacity, the more likely they are to persist in their educational endeavors.

The act of socially integrating into the campus community has been shown to be a cumulative process and that the development of mentors, connections with faculty members, and the formation of friendships with peers are important factors for student engagement and integration (Swail, 2004). It is, therefore, essential for students to make meaningful connections to the campus early in their academic experience. Additional opportunities such as participating in student organizations or clubs and engaging in campus social traditions can also positively influence institutional commitment and retention (ibid.).

For students from ethnic minority populations, peer support (Dennis, Phinney, & Chuateco, 2005) and social integration (Pincus & Decamp, 1989) are strong predictors of retention and academic achievement. Tinto (2004) underscores that for students from underrepresented populations, it is important to remove real or perceived cultural barriers such that students can better connect with the campus community at large. Interestingly, adult students, especially those with families and other commitments (e.g. full-time employment), do not view campus social integration as important and consequently this variable was not important to predicating their persistence (Metzner & Bean, 1987). This example highlights how some factors have differing levels of influence to different student populations (ibid.).

Factors relating to social engagement should be considered for inclusion in risk modeling where available.

Financing College. The general availability and use of financial aid has been linked to increased access and improved retention rates (Gansermer-Topf & Schuh,

2005) particularly for students from lower-income groups (Pascarella & Terenzini, 2005) with the highest rates of retention most closely linked with the use of grants and scholarships over loans (Dowd & Coury, 2006; Gross, Hossler, & Ziskin, 2007). Minority students, who are also more likely to come from low-income families, show similar improved retention with access to financial aid and the greatest improvement with grants versus loans (Swail, 2004). Despite this good news in terms of access and retention, Horn and Carroll (2006) found that there is an unfavorable inverse correlation between the number of Pell grant recipients (low-income students) at the institution and the six-year baccalaureate degree graduation rate – as Pell grant recipient enrollment increases six-year baccalaureate degree graduation rates drop.

Students utilizing financial aid to finance college are also more likely to work excessively while enrolled, be enrolled as a part-time student, or to live off-campus all of which can adversely affect their study time and their ability to socially integrate into the campus consequently negatively impacting their retention (Tinto, 2004). These students are also more likely to have other characteristics such as poor preparation and being a first generation college student, putting them at-risk of premature departure (Demetriou & Schmitz-Sciborski, 2011).

Factors relating to the financing of college should be considered for inclusion in risk modeling where available.

Academic Self-Concept. Academic self-concept can be viewed as the academic dimension of Self-Concept (Shavelson, Hubner, & Stanton, 1976) relating to the individual's perception of self-efficacy in academic matters which can be both global

(Language, Mathematics, etc.) and domain specific (spelling, fractions, etc.) (Bong & Skaalvik, 2003). The causal relationship between academic self-concept and academic achievement is important. Does positive academic self-concept promote higher academic achievement, does higher academic achievement promote positive academic self-concept, or are the two mutually reinforcing reciprocal relationships? It is believed that there is a mutually reinforcing reciprocal relationship (Marsh & Craven, 2006) such that improvements in academic self-concept lead to improvement in academic achievement and vice versa.

It is possible to influence academic self-concept and academic achievement through student-faculty interaction in that positive academic self-concept is promoted when students perceive faculty as respectful, approachable, and available outside of class. Such students are more likely to feel confident about their academic abilities, to be academically motivated, and more likely to enjoy learning (Chickering, 1969; Eli & Bowen, 2002; Komarraju et al., 2010).

Bailey (1971) demonstrated that achieving students have a higher self-concept of their abilities and have only a small disparity between perceived and real ability, suggesting that academic self-concept may be important when seeking to predict academic performance. Valentine, DuBois, and Cooper (2004) more recently demonstrated via a meta-analysis that academic self-concept and academic achievement not only have a significant mutually reinforcing reciprocal relationship but that this relationship is generalized across age, gender, ethnicity, and national origin.

Marsh and Seaton (2013) also note that “the reciprocal relationship has also been demonstrated to be valid cross-culturally” (p. 62).

Factors relating to academic self-concept generally or specifically will likely be important and should be considered for inclusion in risk modeling where available.

Goal-setting Theory. Goal-setting theory is based on the concept that individuals who set goals are more likely to perform at higher levels than individuals who do not set goals and overall performance is influenced by goal specificity, challenge, commitment, feedback, and task complexity (Locke & Latham, 1990). Goal setting activities have been demonstrated to positively influence student retention and in identifying and overcoming obstacles to academic success (Sorrentino, 2007). Goal setting was found to be particularly effective in the retention of students on academic probation (Kamphoff et al., 2007).

Goals that are challenging, specific in scope, and well defined lead to the most favorable outcomes. Performance is also affected by the individual’s commitment to the goal, belief that the goal is achievable, and the belief that the student has the required skills (Demetriou & Schmitz-Sciborski, 2011).

The goal-setting of community college students is substantively different than that of four-year college students (Brewer & Gray, 1999). Four-year students are more likely to have product goals such as graduation or mastery goals such as attainment of knowledge in a particular major. community college students, on the other hand, commonly set product goals of transferring to a four-year institution or mastery goals of remaining within a specific discipline (i.e. engineering) (ibid.). Robbins et al. (2004)

stress that students who set academically-focused goals and associate those goals with graduation are more likely to be retained and ultimately graduate. This, therefore, suggests that incremental goals (e.g. examination or course performance) that integrate into larger overarching goals (e.g. GPA targets or graduation) are more effective.

Students' propensity for goal-setting and the identification of their specific goals would be meaningful in helping identify students at risk of departure as well as helping the student to achieve those goals. Therefore, such measures should be included in a risk model where available.

Motivational Orientation. Motivational orientation is a psychological construct that attempts to explain behavior and has been used by many scholars to understand and predict student behavior (Allen, 1999; Baker, 2004; Lin & McKeachie, 1999; Markus & Kitayama, 1991; Phinney, Dennis, & Osorio, 2006; Pincus & Decamp, 1989; Robbins et al., 2004). Motivational orientation can be divided into factors that are intrinsic or extrinsic. Intrinsic motivation relates to an internal self-desire to act, to seek out new things, to analyze one's capabilities, or to gain knowledge. An intrinsic motivation is driven by a fundamental interest or enjoyment in the endeavor itself and not by external pressures, influences, or rewards (Ryan & Deci, 2000). Extrinsic motivation involves a locus that is external to the individual and relates to factors such a desire for the outcome or reward (e.g. money or grades), or to avoid an undesired outcome (e.g. punishment or dismissal). Competition can also be viewed as an extrinsic motivator as it encourages the competitor to win and not simply to enjoy the intrinsic rewards of the activity (ibid.).

In an examination of the relationship between intrinsic and extrinsic motivation to college adjustment, stress, well-being and academic performance Baker (2004) found that intrinsically motivated behaviors were associated with lower stress levels and improved academic performance. Lin and McKeachie (1999) found that students with a mixture of extrinsic and intrinsic motivations tended to perform better in college with those who had high intrinsic and medium extrinsic motivations performing the best.

In looking at persistence and graduation it was found that having a strong internal motivation was more predicative of success than background, demographic, or precollege characteristics and especially meaningful for minority students (Allen 1999). In another study internal academic achievement motivation was a strong predictor of academic performance as measured by GPA, as was the desire for intellectual development and a fulfilling career (Robbins et al., 2004). Similar personal and career motivational factors were found among students from ethnically diverse backgrounds (Phinney, Dennis, & Osorio, 2006). Students who had successfully completed their degree cited intrinsic factors while those not graduating more often cited extrinsic motivations (Pincus & Decamp, 1989).

Cultural norms and values also influence the motivational dimensions of students (Phinney et al., 2006). Students from collectivist cultures (e.g. China, Korea, and Japan) which emphasize family and group goals over individual desires are often highly extrinsically motivated regardless of their intrinsic dimension. In contrast, students from individualistic cultures (e.g. United States, United Kingdom, and

Germany) are more often intrinsically motivated often relating to personal interests, career aspirations, and intellectual curiosity (Markus & Kitayama, 1991).

Measures of students' motivational orientation on key aspects of academic goals (e.g. attending college, graduation, program of study, time to graduation, etc.) would likely be predicative of retention and should be included were available.

Personality Traits. Many contemporary scholars have documented the predicative power of personality traits in academic achievement and rendition (Furnham, Chamorro-Premuzic, & McDougall, 2003; Lounsbury et al., 2003; Newsome et al., 2000; Nofle & Robins, 2007; Wagerman & Funder, 2007) even when controlling for cognitive and intellectual ability (Newsome et al., 2000; Nofle & Robins, 2007; Wagerman & Funder, 2007). The most commonly used model is the Big Five personality trait model (Costa & McCrae, 1992) which consists of five factors: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. In brief, **Openness** spans the poles of inventiveness and curiosity to consistency and caution, **Conscientiousness** spans the poles of efficiency and organization to easy-goingness and carelessness, **Extraversion** spans the poles of being outgoing and energetic to being solitary and reserved, **Agreeableness** spans the poles of being friendly and compassionate to being analytical and detached, and **Neuroticism** spans the poles of being sensitive and nervous to being secure and confident.

Of the five factors Conscientiousness is most strongly linked to predicating academic performance (Furnham et al., 2003; Lounsbury et al., 2003; Newsome et al., 2000; Nofle & Robins, 2007; Wagerman & Funder, 2007) with the facets of

Conscientiousness such as achievement-striving, diligence, organization, perfectionism and self-control having the greatest impact (Lounsbury et al., 2003; Nofle & Robins, 2007). In a broader examination across four different samples and four distinct personality inventories the trait of Conscientiousness was positively linked to both high school GPA and college GPA and predicative of college GPA even when controlling for both high school GPA and SAT scores (Nofle & Robins, 2007). Nofle and Robins (2007) suggest that the willingness to work hard is a robust predictor of academic achievement.

Wagerman and Funder (2007) cite that Conscientiousness measures improved predictive risk models accounting for variances in both freshman (4.8%) and senior (9.3%) college cumulative GPAs suggesting that when such measures are available they should be included.

Limitations of the Study

The data set. The primary limitations of this study relate to the data set available. The data provided by the Institutional Research office were extensive, including 58,903 records spanning approximately 130 variables for the most recent five academic years (2009-2013). Regrettably, significant amounts of the data were either missing or their validity was in question. Hence, the variables were trimmed down to what is believed to be the “best available” variables. In this case resulting in the selected 22 variables.

The sample size. Although the sample size was enormous, responses for some variables were highly disproportionate and in some cases spanned numerous sub-

values. Using appropriate statistical analysis and *a priori* assumptions some responses were recoded to improve interpretability.

The assumptions (a moving target). The data used in this study are but a snapshot in time and as such may not be generalized to other time frames. The current social, economic, and political environment of the nation and the geographic region are somewhat turbulent, specifically as it relates to appropriations and budgeting. There are also demographic shifts taking place in the primary and secondary school populations, including significant and prolonged declines in students of traditional college going age. These underlying unstable factors further call into question the reliability of a predicative model.

The methodology and software. Software limitations guided how the data were analyzed. Although a logistic regression was the method of choice, the software available could only run logistic regression using listwise deletion resulting in a significant loss of data. Since the missing data were not missing at random some of the more sophisticated data handling procedures would not have been appropriate. This in conjunction with the fact that the ANOVA and OLS regressions were in general agreement even with the rather truncated logistic regression analyses, the listwise logistic regression was used.

The lack of data. It is clear that many important variables are missing from the data set, and therefore omitted from this model. It will be important to give careful consideration to which variables should be added and equally important how the data are collected for future work.

Correlation on independent variables. Although multiple variables were highly correlated (e.g. material and paternal educational levels, $r(58,833) = .941, p < .000$; material educational and primary language, $r(58,778) = .935, p < .000$; and full-time/part-time status and day/evening status, $r(58,646) = .415, p < .000$) these variables were still included in the examination of the risk model.

Future Work & Research

A model that can explain less than 4% of the variance in first-year student retention is unacceptable and at this time implementation of such a model would not be recommended. In the event that the institution decides to pursue the development of a more reliable predictive model, additional research will be critical. The research recommendations in this section are informed both by the limitations and the recommendation as identified above.

Variables and data collection. As noted previously in this chapter and reinforced here, additional research should be focused on the incorporation of additional relevant theories and variables that can readily be collected. Even if the institution abandons predictive risk modeling, work on individual aspects of these theories and variables, specifically as they relate to community college students, would be a worthwhile contribution to the field.

Adaptive feedback. As students progress through their coursework, their academic behaviors and personal choices become more predictive than the initial risk assessment. Therefore, being able to integrate pre-entry predictive risk modeling with relevant real-time feedback, such as classroom attendance (more importantly non-

attendance) patterns, mid-term (or earlier) warning statuses that carry relevant weight with regard to a student's likelihood of retention should be used to dynamically update the model.

Intervention measures. The current work focuses on what factors impact first-year retention. However, thought and research must also be directed to what interventions could and should be implemented. Simply being able to forecast the likelihood of retaining a student is purely an academic endeavor if the institution is unable to intervene to assist the student.

Beyond the first-year. First-year retention should remain a primary focus. It represents the biggest risk for most students and improvements yield "the biggest bang for the buck". However, with more students attending on a part-time basis they are by default lengthening their time to graduation (or transfer) increasing the likelihood that something else might arise that results in their attrition. It will, therefore, become relevant to also look at retention measures beyond the first-year and ideally include measures that assist with improved (and hopefully timely) completion rates.

Student success research agenda. Change is not easy; taking time, money, and effort to become realized. To narrow attention and maintain focus on the overarching goals of the institution a formal targeted research agenda should be developed. In this agenda, important questions about student success, including retention, should be formulated. In this concerted way there will be better institutional attention directed at the problems and in finding solutions. For example, an examination of targeted student populations, or at gateway courses (i.e. English and mathematics) may help shed light

on the issues, either helping to address the stated questions or lead to other relevant questions about student success and retention.

Conclusion

The collection and interpretation of data is becoming more and more critical in all aspects of our society and higher education is no different. We have an opportunity to utilize data to better understand students and how they interact with the institution. In this study, data were used in an attempt to better identify students at risk of departing the college. This work is really only “one side of the coin”. Knowing who is at risk is almost irrelevant unless one can intervene. The “other side of the coin” would be the efficient deployment of resources, matching appropriate intervention to students in order to help retain and ultimately graduate these students. Although the multiple analyses conducted in this study all highlighted similar factors that contribute to student departure, the predicative power of these data was limited, and therefore not functional as a predictive model.

Institutions of higher education, and particularly community colleges, still continue to face challenges in retaining students who are most at-risk. The social, educational, and economic impacts of this challenge are great. Despite improvements in access to higher education, the most at risk students continue to face significant obstacles to retention and completion. Such obstacles contribute to a cycle of social reproduction, sustaining and reinforcing constructs of societal and institutional oppression. Education should be a means to democratize and permit socio-economic mobility, empowering students and the next generation. It is, therefore, imperative for

institutions of higher learning and scholars to continue to wrestle with these challenging and complex issues to identify effective strategies to help such students overcome these obstacles.

It is this daunting yet noble commitment, to these issues, and to these students that ultimately defines the institutions and as a community college – a college of the community – it is important that we play our part and provide appropriate leadership to support those most at risk in our community.

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