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Background or Experience? Using Logistic Regression to Predict College Retention

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ABSTRACT

Tinto, Astin and countless others have researched the retention and attrition of students from college for more than thirty years. However, the six year graduation rate for all first-time full-time freshmen for the 2002 cohort was 57%. This study sought to determine the retention variables that predicted continued enrollment of entering freshmen at a large urban, four-year, public institution. Logistic regression was utilized to analyze the data collected over a four-year period.

The population studied was 1,346 first-time full-time freshmen entering fall 2007. The variables chosen for analysis were ACT composite, cumulative GPA and high school GPA, ethnicity, gender, Pell eligibility, unmet financial need, advising, early alert notices, engagement and freshman year experience courses, honors participation, change of major, campus housing, and supplemental instruction. Data were analyzed by year of enrollment through spring 2011. Correlation studies eliminated the threat of multicollinearity. The logistic regression models passed goodness-of-fit tests for Hosmer Lemeshow, Omnibus Test of Coefficients, and Cox and Snell and Nagelkerke.

The analyses found that ACT Composite, cumulative GPA, advising, ethnicity, engagement courses, change of major, and supplemental instruction were predictors for

retention. In year one, two, three and four each one point raise in GPA increased the likelihood of persistence by 3.99, 3.31, 3.52, and 11.60 times, respectively. In year one and two students who were White were 2.29 times and 1.74 times more likely to persist, respectively. Living on campus and having advising appointments in the first year increased the likelihood of persisting by a factor of 1.46 and 1.21, respectively. Changing major in the first year increased the likelihood of returning by a factor of 4. In the fourth year, each change of major decreased the likelihood of persisting by a factor of .62; having a higher ACT composite score decreased the likelihood of persisting while supplemental instruction sessions increased the likelihood of persisting.

Investigative efforts to validate the coding of participation in freshmen year experience courses found large discrepancies between the reported and actual frequency counts reported by the system. A need to audit and correct student information system data related to retention variables was noted.

Keywords: retention, predictors, persistence, logistic regression, higher education

DEDICATION

My mantra through this work has been:

I can do all things through Christ who strengthens me.
Philippians 4:13 (World English Bible)

I also dedicate this work to my family and friends who gave unending support. I especially recognize my husband, Brantley, and daughter, Clancee. Thank you for the love and understanding you gave as I fought to complete this trial. I pray the hours of time away bonded you both together as a loving father and daughter and strengthened us as a family. Without your help, encouragement, and love I could not have completed this work. To my family, I thank you for teaching me the importance of life-long learning, hard work, and determination. To my dear friend Beverly Woods, I thank you for listening and for providing me with the assurance that I could complete this task.

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1. INTRODUCTION

In 2008, the New York Times reported that the economic disparities between adults who have degrees and adults without degrees are growing. U.S. Census data of annual salaries demonstrate the increasing gap between salary and level of education. The 2008 report showed that workers with high school degrees earned an average annual income of $26,712. Adults having some college credits earned $32,793. Those with undergraduate degrees earned an average pay of $46,277. Adults with graduate degrees earned $61,014 (U.S. Census Bureau, 2009).

Rising unemployment rates mirror the progression. In 2007, adults with advanced degrees (at a Bachelor's level or greater) had an unemployment rate of 2.3%; Individuals with some college experience had an unemployment rate of 3.8%. Those without degrees had an unemployment rate of 4.7% (U.S. Census Bureau, American Community Survey, 2008).

In a New York Times article, writer Sara Rimer noted that college enrollments were increasing. Unfortunately, high percentages of students were leaving before completing a degree (Rimer, 2008). In 2004, the U.S. Department of Education reported an average six-year graduation rate of 57 % across 1,300 colleges. Comparing the graduation rates of similar higher education institutions (based on levels of selectivity and low-income enrollments), even the graduation rate of "very selective master's degree institutions" was only 64 %. Fairing worse, the average graduation rate for "moderately

selective institutions with large low-income enrollments" was 44 % (U.S. Department of Education, 2007, p.161).

Anthony Carnevale, the director of the Center on Education and the Workforce at Georgetown University, predicted that with a U.S. recession looming and rising rates of unskilled adults attempting to enter the workforce, a potential crisis among America's higher education system was building. He said to the Times, "The people who survive the best have always been and continue to be the ones with postsecondary education" (Rimer, 2008, p A21).

Statement of the Problem

In 1993, Vincent Tinto concluded that despite forty years of research focusing on student retention, colleges and universities had not improved the higher education graduation rate beyond 57% (Tinto, 1993). In 2012, the U. S. Department of Education released the graduation rate for the 2002 cohort of first-time full-time freshmen entering four year institutions. Again, 57% of the students obtained a degree within a four-year time frame (U.S. Department of Education, 2012).

Regardless of this lukewarm success rate for students, higher education has become an increasingly more critical component for the future of society (Rimer, 2008). An economic recession threatened reduced salaries and scaled-back expectations creating a rising demand for degrees (American Community Survey, 2008). At the apex of the issue is an economic crisis that reduced funding for higher education (Lowry, 2010). The problem is that higher education has not conducted the individual institutional studies to address retention strategies and quantitatively demonstrate their effectiveness (Tinto, 1993).

While reviewing the research for best practices may be beneficial, it is critical to isolate the unique approaches that can improve outcomes for individual universities most in need of improvement. Tinto called for higher education to take the accumulated retention research and translate it into "forms of action," (p.5) to facilitate substantial gains in student persistence and graduation" (Tinto, 2006).

Purpose of the Study

The purpose of this study was examine the relationships between student and family background characteristics, academic preparation and performance traits, and institutional constructs and their ability to predict the likelihood of students remaining enrolled in a large, urban, public, institution with very high research activity. A quantitative study using logistic regression was conducted to analyze the relationship among the variables and their ability to predict student persistence in higher education.

Significance of the Study

Higher education must do a better job of meeting the needs of students and seeing them through to degree attainment. It is important for the future of students, the future of higher education, and the future of society as a whole. In an address to a joint session of Congress on February 24th, 2009, President Barack Obama spoke to issues in education and the economy by saying, "In a global economy where the most valuable skill you can sell is your knowledge, a good education is no longer just a pathway to opportunity- it is a pre-requisite" (Whitehouse.gov, 2009).

Alexander Astin noted that for nearly 40 years, researchers have developed and tested prediction retention models based on student characteristics and institutional

attributes. In 2006, Astin challenged schools to test "input" differences by considering the characteristics of students when "constructing formulae for predicting degree completion from entering freshmen "(Astin, 2006). George Kuh (2001) encouraged schools to focus on "culture building… [to] influence student satisfaction, achievement and …whether a student persists and graduates"(Kuh, 2001).

The 2008 report of the National Survey of Student Engagement (NSSE) results encouraged colleges to focus on creating a sense of belonging and bolstering measures for student engagement. Its authors found that, "Regardless of precollege engagement disposition, higher scores on Level of Academic Challenge, Active and Collaborative Learning, and Student Faculty Interaction were related to higher rates of an intention to return the following year (National Survey of Student Engagement, 2009).

The 2009 U.S. Census Bureau's Report demonstrated how higher education has become a critical factor in the expected livelihood of adults and their families. The numbers reflected that high school graduates earned 51% less in average annual income than individuals having a Bachelor's degree , Master's degree, or higher. Individuals possessing merely a high school diploma earned 45% less in average income than individuals having Bachelor's degrees (United States Census Bureau, 2012).

Despite high expectations and a growing demand for more educated adults in the workforce, declining funding in higher education compounds the problem. In 2010, Bob Lowry of the Alabama newspaper, the Huntsville Times, reported that the reduction in funding for higher education caused administrative officials to evaluate the necessity for supplementary student programs and services. Earlier that year, Alabama's college presidents lobbied the state legislature on behalf of the Council for University Presidents.

Alabama's higher education state budget had suffered a 26% loss over a two year period. This placed Alabama second to Florida in terms of percentage of lost financial support among states. They asked for the funds to be restored. The school presidents feared that colleges would face layoffs and administrative cut-backs and would likely be forced to consider cutting course offerings and programs (Lowry, 2010).

In April 2011, Scott Carlson with The Chronicle of Higher Education profiled North Carolina at Greensboro's funding losses by saying, "In the past three years, North Carolina at Greensboro has lost tens of millions in state dollars and will very likely see a new cut of at least $26 million, or 15% of its state support, by midsummer." He interviewed the chancellor of the University of North Carolina at Greensboro, Linda P. Brady, who addressed the budget crisis. Similar to Alabama's university presidents, Brady considered capping enrollments, cutting internal budgets, and streamlining curricula to usher students through to degree attainment in a timelier manner. She also addressed the complicated issue of communicating the dilemma to faculty and stakeholders. Discussing how she manages competing priorities from state legislators and esteemed members of academia, the chancellor stated, "At some point you have to say, we are educating as many students as we can" (Carlson, 2011).

Funding for higher education was not predicted to improve in the near future. In 2009, President Obama set this goal, "…by 2020, America will once again have the highest proportion of college graduates in the world" (Whitehouse.gov, 2009, p. 3). The U.S. Department of Education translated this goal into numbers. In its 2010 National Education Technology Plan the goal became, "By 2020, we will raise the proportion of

college graduates from where it now stands (41%) so that 60% of our population holds a two-year or four-year degree" (U.S. Department of Education, 2010, p.2).

A year later on February 14, 2011, the Obama administration released its education budget proposal. John Lauerman with Bloomberg summarized the plan. To secure the Pell Grant program and improve kindergarten through high school education it will cost the country "89 billion dollars over 10 years." The funding will be made possible by redirecting funds once earmarked for universities to k-12 and the federal grant program. The higher education budget will be reduced while schools in kindergarten through twelfth grade will experience a 6.9% raise in spending (Lauerman, 2011).

By increasing the number of students who remain enrolled, colleges may buffer the effect of losses in funding. Bringle, Hatcher, and Muthiah (2010) reported, "…the income produced by four first-year students who leave after one year is equaled by one student who remains at the institution for four years" (Bringle, Hatcher & Muthiah, 2010, p. 10).

As discussed earlier, the 2009 U.S. Census Bureau Report demonstrated that individuals with higher education degrees obtained employment with higher salaries (U.S. Census Bureau Report, 2009). Researchers Whalen, Sanders and Shelley called for institutions to collect student data using, "several sources of information that provide information about student experiences that contribute to retention within a specific institution" (p. 408). They also recommended examining the interactional effect of the variables (Whalen, Sanders, & Shelley, 2010). Conducting the analyses will enable institutions to determine the most effective programming for increasing student retention.

This is a must for growing tuition revenue while also supporting students through to degree completion.

Vincent Tinto stated, "there is a critical and yet unexplored link between student learning experiences and student leaving" (Tinto, 1993, p.69). This study sought to address the question: What policies and programs can colleges implement to outweigh the influence of students' background characteristics and have a greater influence on persistence? It anticipated informing higher education's budget process for making strategic decisions to increase student retention rates.

Theoretical Framework

The theoretical framework for this study came from the work of two prominent authors of college retention literature, Vincent Tinto and Alexander Astin. Tinto gave his view of the many quantitative predictive studies of student departure from higher education by saying they were limited. He said these studies described "system departure." He asserted that the studies spoke to why students left higher education as a whole. The studies did not address why students left individual institutions. Each college campus or higher education institution possessed unique qualities that were not attended to by the large, multi-institution studies. For this reason he concluded that the studies could not "be used to study institutional departure" (Tinto, 1993, p. 5).

In contrast, Alexander Astin published a number of longitudinal studies involving large data sets collected across multiple institutions. He concluded that "half or more of the variation among institutions in their students' responses to certain engagement items can be attributed to input differences rather than to differences in institutional effects"

(Astin, 2005, p.). Tinto challenged researchers to conduct studies that produced policy implications by distinguishing between aggregate patterns of departure, types of leaving, academic relevance, and individual institutional differences (Tinto, 1993).

Vincent Tinto published his first discourse addressing higher education enrollment in 1972 in an effort to determine whether the location of higher education institutions in relation to the population of surrounding students encouraged enrollment and retention. He conducted the study by examining access issues and students' perceptions of the value of higher education degree attainment. Later in 1975 and revisited in 1987, Tinto penned the Student Integration Model. Tinto theorized that students' social integration into the institution was of greater import than the background and reported attributes they brought with them to college (Tinto, 1972).
updated his theory of student integration. He compared a student's entrance and integration into college life to the rites of passage as studied and reported in social anthropology models. Leaving high school and moving on to college was likened to being one more milestone in the life of a student (Tinto, 1993).

Tinto used Van Gennep's stages of social integration and compared them to the steps students take to successfully integrate into the social environment of the institution. First, students took steps to break from the past. Those who kept continuous social contact with their friends from high school found fitting-in to the college environment more difficult. Second, the students broke from their past environments. They increased interactions with fellow students and faculty and became involved in coursework. Third, students became incorporated in the institution. They became an integral part of the college. Students found social circles to join and regularly participated. The students took

on responsibilities in student organizations, academic areas, or in roles that defined them as a student on the campus (Tinto, 1993).

To explain attrition of students from higher education, Tinto's model drew upon a comparison to suicide. Specifically, Tinto defined egotistical suicide from college as a student's choices to withdraw and leave much as suicide victims chose to withdraw from living rather than being open to the influencing traits of the campus community. Tinto stressed that the willingness to stay was paramount to student retention. To combat attrition, Tinto challenged higher education to establish initiatives targeting incoming freshmen. He recommended the programs be designed to equip students with the skills needed to be successful in college; introduce them to fellow students; and encourage the formation of a social attachment to the university. These bonds were needed to sustain students through to a completed degree program (Tinto, 1993).

In contrast to Tinto, Astin's article, "What matters in college," promoted the importance of entering student traits and their influence upon the prediction of success in degree attainment. Astin measured the influence student characteristics bore upon "academic development, personal development, and satisfaction" (p. 2). He examined outcomes against the interactions of students while attending college (Astin, 1993).

While acknowledging that any means by which students are involved in campus or institutional activities improved the learning experience, Astin found differences among genders and racial groups. He attributed the differences to peer interactions and the influences peers had upon development and growth. Astin noted that these influences came from same gender and same racial group interactions. He believed this spoke to the influence of students' entering characteristics. In other words, he found that peer

interaction and involvement in college-related activities were influential. However, he concluded there were no discernible changes facilitated by institutional constructs. Astin believed that changes in development would have occurred to the same degree in any environment (Astin, 1993).

Astin found faculty to be one institutional factor to be influential across many areas. He saw positive correlations for interactions with faculty in the area of student outcomes. Astin noted that research institutions saw lower rates of these interactions and he attributed this to a lack of institutional emphasis on quality teaching (Astin, 1993).

Later, Astin challenged the measures of college retention and theorized that student characteristics had a greater effect on predicting persistence than did any program or curricula. His theory of college retention postulated that colleges could predict their retention rates by examining the characteristics of incoming students. He recommended colleges collect and analyze high school grades, college admission test scores, race, and gender. His study in the late nineties found that two-thirds of students possessing high college admission scores and 4.0 high school grade point averages were equipped to complete a degree within four years. Students who had 2.0 grade point averages in high school and relatively low college admission scores were only 20% as likely to complete a degree within a four-year time frame. His observations also included the results of an analysis of students who persisted in college for longer than five years. Astin noted that the students' records increasingly began to resemble the peers who had dropped-out from college entirely (Astin, 1997).

Interestingly, though Astin sought to show the importance of student inputs, he recommended that colleges examine student programming and institutional policies if the

student retention rates were not at expected levels. The variables he found to influence degree attainment were majoring in non-social science majors and the sequencing of course offerings by colleges. His recommendations to campuses included: a) examining the curricula and course offerings and b) reviewing policies, and c) incenting or requiring students to live on-campus (Astin, 1997).

Research Questions

The research questions posed included:

1. Does the academic preparation and performance of students predict retention?

2. Do student characteristics and family background predict retention?

3. Does participation in institutional approaches to retention predict retention?

Creswell (2003) recommended including hypotheses when they build on the research questions or follow the tradition in the literature. Because a number of the articles reviewed utilized prediction models, null hypotheses indicating the direction of the prediction models were written (Creswell, 2003, p. 109).

These were

1. Academic Preparation and Performance variables do not predict retention,

2. Students' Family Background and Demographics do not predict retention, and

3. Participation and interaction with Institutional Constructs does not predict retention.

Definitions of Terms

Advising: "…is a series of intentional interactions with a curriculum, pedagogy, and a set of student learning outcomes. Academic advising synthesizes and contextualizes students' educational experiences within the frameworks of their aspirations, abilities and lives to extend learning beyond campus boundaries and timeframes" (NACADA, 2006).

Completers: "students who obtain' a degree (Tinto, 1993, p.29).

Departers: "students who dropped out without having earned a four year degree" (Tinto, 1993, p.29).

First year experience (FYE) programs: "programs that are designed to incorporate a core set of common classroom experiences focusing on college survival skills, transition issues, and career and personal development (Bai & Pan, 2009, p. 292)

Freshmen learning community (FLC): "a course structure created by students registering for a block of classes together, in which students form supportive peer groups becoming both academically and socially connected" (Bai & Pan, 2009, p. 292).

Involuntary departure: when students leave college due to academic dismissal (Tinto, 1993, p. 35.)

Persisters:"everyone who …was either still enrolled in a four-year college via continuous attendance or had enrolled again after having stopped out sometime after first entry to college" (Tinto, 1993, p.29).

Stop outs: individuals who "after leaving college, re-enter at a later time to complete their degrees" (Tinto, 1993, p 26).

Voluntary departure: when students who have "adequate" grades leave college (Tinto, 1993, p. 29).

Delimitations

1. The study collected a variety of both student and institution-specific variables which provided an in-depth look at factors that could have the potential for predicting student retention.
2. The data collected spanned a four-year time span from entering fall semester through the fourth spring term allowing the minimum time needed to complete an undergraduate degree at the institution.
3. The population of students included those who entered the institution having not attended another higher education institution following completion of high school.
4. The dataset analyzed was the result of data collected from multiple sources across a variety of campus departments allowing a broader view from entry characteristics to performance measures to degree attainment.
5. The researcher is a member of the campus-wide committee dedicated to enacting institutional policies and procedures for the purpose of increasing retention and graduation rates for undergraduates. This has the benefit of providing an in-depth knowledge of the current issues unique to the institution and the data available and/or needed for analysis.

Limitations

1. The uniqueness of the institution of study limited the applicability of the findings to other higher education institutions. Based on the Carnegie Foundation's set of institutional classifications, no other institution matched this one when all classifications were defined (Carnegie Foundation, 2011).

2. Qualitative data were not collected which could have explained additional features, considerations, or possible hidden factors pertinent to drawing conclusions for the study.
3. The data collected were limited to a four year time period (from entering Fall 2007 through Spring 2011). Students may have completed their degrees in subsequent terms.
4. The dataset did not contain the identified cohort used for institutional reporting for first-time full-time freshman retention rates made available online by the Department of Education Center for Educational Statistics. Therefore, the findings may not match the outcomes that could be obtained by examining the reporting cohort in the same manner.

Organization of the Study

The study is organized into five chapters. Chapter One contains the introduction, statement of the problem, purpose, significance of the study, theoretical framework, research questions, definitions of terms, delimitations and limitations, and organization of the study. The literature review is provided in Chapter two giving a synopsis of articles related to college retention. Chapter Three outlines the research design, population, site selection, data collection, data preparation, model building, subsets, correlation studies, multicollinearity, stop-outs, and logistic regression. Chapter four presents the results by year, summary, and predictors by year of enrollment. Chapter five presents the findings, implications and recommendations and the conclusion. results of the analyses. a summary of the results, recommendations, and conclusion.

2 LITERATURE REVIEW

Institutional Predictive Retention Models

As discussed earlier, Astin (1993) asserted that institutions of higher education can measure their effectiveness at retaining students by quantifying and calculating the input characteristics of entering students. If schools found that their actual rates were incongruent with the predicted rates, Astin recommended evaluating institutional practices.

Astin has a lengthy history of examining the characteristics associated with degree attainment and higher education practices. One of his earliest publications was a report written in 1967 for the American Council on Education entitled, "National norms for entering college freshmen, Fall, 1966." Several iterations of this particular report were published for subsequent years and entering groups of freshmen cohorts analyzed. Interestingly this report provided the definition for "first-time, full-time freshmen" a term still used in discussions surrounding the comparisons of institutions' retention rates. The report also marked the inception of the American Council on Education's longitudinal study of "how students … are affected by their college experience…" (2003, p.21).

Since 1966, the Cooperative Institutional Research Program (CIRP) with the help of the Higher Education Research Institute (HERI) based at the University of California-Los Angeles (UCLA) issued over forty follow-up surveys to "eleven million freshmen at more than seventeen hundred institutions… [and] 400,000 faculty" (p. 324). In 2003, Astin wrote a commentary about CIRP's collection of findings. He urged institutions to

continue participation in the longitudinal study fearing colleges will abandon the efforts. Astin discussed his fear that colleges would discontinue the CIRP data collection in favor of one-time "cross-sectional" assessments which he finds to be less valuable. CIRP data has provided the means for the construction of a number of institutional predictive models for retention. Astin and his fellow researchers have applied many of the models to institutions of higher education (Astin, 2003). What follows is a discussion of statistical analyses, measures and recommendations for predicting retention rates using student data; both precollege and post matriculation.

Ryan and Glenn conducted a quasi-experimental design to study the problem of poor retention rates of college students. They sought to identify effective practices for the use of higher education institutions seeking to retain populations of largely first-generation commuter students by examining the five-year student retention effort of an urban school. Taking Tinto's model of student departure, Ryan and Glenn tested the hypothesis that the students at this school, being "naïve learners" (2003, p.300) would benefit most if taught to be better equipped and committed to their learning. Ryan and Glenn (2003) conducted evaluations to answer eight questions regarding the role of students' satisfaction with choice of institution, improved academic skills, abilities, and performance; and probation measures. To assess student satisfaction with the institution, Ryan and Glenn (2003) administered a survey using a Likert scale to rate the appealing aspects of the university to a sample of 608 first-time full-time freshmen. The sample represented 41% of the 1,500 person freshmen class.

Using a stepwise regression model, the analysis revealed six areas students rated as important: a)"friendliness of students" on campus, b)"faculty standards" for academic

performance, c)"diversity of students" , d)"quality of instruction", e) "registration convenience" for freshmen, and f)"attractiveness of the campus" (Ryan & Glenn, 2003, p.301).

Ryan and Glenn next focused on the two areas of satisfaction dealing with instruction and academic performance standards. They tested the hypothesis that students who experienced academic success had high retention rates. The researchers identified three cohorts based on the criteria: first-time first-year students; admitted with good academic standing; fulltime (enrolled in 12 or more hours); and beginning fall semester. The GPA's of these 4,703 students were analyzed and netted these results: following fall semester, 64% remained in good academic standing; 32% were placed on academic probation; 25% of the students on probation returned for spring; 44% of the students on probation were academically dismissed from the university following spring semester. Of the 70% in good academic standing following fall semester, only 28% of those on academic probation enrolled the following fall term (Ryan & Glenn, 2003).

Seeking to implement procedures to increase retention, Ryan and Glenn targeted the process for addressing students placed on academic probation by the university. These procedures included identifying students for intervention measures, instituting probation prevention programs, bolstering study skills training, intensifying supplemental study skills training, and instituting freshmen seminar courses for regularly admitted students. Ryan and Glenn studied the retention rates of students who participated in the probation intervention programming.

Ryan and Glenn found that the retention rates of students choosing to participate in study skills training courses increased by 10%. Identifying students having academic

difficulty by instructor referrals was found to net higher final grades than the previous method of identifying students solely on self reports. Instructors referring students with grades of D's or F's to advisors within the first five weeks of classes netted 3% and 4% increases in overall retention rates. Identifying specific freshmen courses and intensifying the supplemental instruction seminars for targeted students, the university again increased retention rates (Ryan & Glenn, 2003).

Ryan and Glenn (2003) chose to institute a summer bridge program to target at-risk students entering the university in fall term. The outcome was a doubling of the university's retention rate of provisional students from 29% to 61%. Finally, reconstructing freshmen seminar courses to include more directive academic skills training taught by specialized staff did not impact the retention rates of students who were placed on academic probation at the end of the fall term. Students achieving good academic standing also did not show a greater retention rate than freshmen who achieved good academic standing fall term who were not in the same bolstered seminar course. The dominant outcome of Ryan and Glenn's experimental study showed that the increased institutional focus on retention through a variety of measures was successful in increasing the retention rates of first-time, full-time freshmen entering college fall term.

Following up on Ryan and Glenn's multifaceted institutional study for increasing retention, Arredondo, and Knight (2006) used the Higher Education Research Institute's (HERI) model to address retention issues at Chapman University. The purpose of the study was to successfully predict the six-year degree attainment of students. The researchers used Astin and Leticia Oseguera's model based on student characteristics to examine their institution's estimated and actual degree completion rates and identified the

characteristics of their students to guide future interventions. Arredondo and Knight's questions were:

> 1) How do Chapman University's estimated four- and six-year degree completion rates compare to actual degree completion rates for the 1996 freshman cohort? How do the estimated and actual rates differ based on a number of characteristics?
>
> 2) What are the characteristics of freshman students who are more likely to be retained and those who are likely to depart prior to degree completion (Arredondo & Knight, 2006, p. 93-94)?

The sample Arredondo and Knight (2006) used consisted of "356 degree-seeking, first time, full-time freshmen in the 1996 entering class…"(p. 95). Students whose records did not contain ACT or SAT scores were not included causing the calculations to be performed for 95% of the freshmen class. The methods included obtaining student information, "high school GPA, SAT scores…, gender, race/ethnicity, entering major/undecided, admit status, distance from home to campus, and in/out of state status" (p.94).

The probability of degree completion in four years and six years was computed following Astin and Oseguera's 2002 model for degree completion rates. The results showed that "gender, high school GPA, SAT scores, and race/ethnicity were better able to predict four-year degree completion rates than six-year degree completion rates..." (p.109). The students who were more likely to persist were women, African American students, and in-state students. The students who were less likely to be retained were men and students who were from out-of-state. Surprising trends discovered in further analysis

showed that students with high SAT scores and Honors Program students did not have retention rates at the expected levels. This provided them with groups to re-examine for further institutional retention efforts. Arredondo and Knight reported a limitation of the data in the inability of the researchers to account for students who may transferred and completed degrees at other institutions. (Arredondo & Knight, 2006).

Danaher, Bowser, and Somasundaram, (2008) conducted a study to examine the attrition rates of their university, analyze the variation across programs and faculties, and focus on the strategies similar universities use to increase student engagement and improve retention rates. The sample group included 3,288 freshmen new to the 2004 first term medium-sized Australian university entering 77 undergraduate programs from five schools. Using the student information database, Danaher et al. (2008) measured retention by counting the students who returned for the second term of the 2004-2005 academic year. To test the null hypothesis, "attrition rates across faculties and programs do not vary and the observed variation we explained as random chance "(p. 3) the researchers used a Chi-squared distribution for categorical data. The two questions posed included

a) could observed variations in attrition rates across faculties and programs be explained simply as random variations, and

b) using attrition rates of larger programs…can patterns identified in the data be explained as chance (Danaher et al., 2008)?

Results of Danaher et al. showed "there is a 99.9% probability that the variation across faculties is significant" (p.) and variation in the attrition rates between programs was significant at the 99.9% level although there was no obvious pattern. Examining the

attrition patterns across their larger programs the attrition coefficient of correlation (r) between the first and second terms was +.38. The attrition coefficient of correlation between the first and second terms was -.44. They concluded that the "discernible variation" warranted a closer inspection of schools to identity unique programs that affect attrition (Danaher et al., 2008).

In another study seeking to identify attrition factors for undergraduate education, Darwin Hendel (2007) sought to determine if first-year experiences make a difference for student satisfaction and retention. Hendel asked two questions:

a) did participants in a first-year seminar have higher satisfaction with college than did freshmen not participating in one, and

b) did high satisfaction influence retention rates for students re-enrolling for a second year (2007)? Participants included a random sample of 1,600 undergraduate students and those who enrolled in a first-year seminar. The Student Experiences Survey was administered to measure the following: overall satisfaction levels and educational quality; evaluation of courses, instructors, and advising; campus experiences; time commitments; evaluation of specific campus services; and plans and expectations (Hendel, 2007, p. 416).

Hendel analyzed the data using t-tests and a logistic regression model to determine if differences existed between students and if participation in the seminar increased the probability of persistence. The analyses revealed that the two groups did not express a significant difference in their levels of satisfaction. Of the 92 items on the survey, 15 had significant differences (2007). Hendel grouped the items into three areas: academic advising; campus experiences; and involvement in campus experiences. Using

beta weights for a logistic regression analysis, high school ranking was found to be a significant contributor while the race/ethnicity variable "approached statistically significant "levels (p. 418). Hendel's findings showed that students in the upper quartile of their high school class were more than twice as likely to persist as students in the lower quartile. White students were more likely to be retained than students of other ethnic groups (Hendel, 2007).

Examining student engagement as a contributing factor for increased retention rates has been an increasing area for examination in higher education. Carini, Kuh, and Klein (2006) contributed to this body of research by seeking to examine the forms of engagement and their possible relationship to retention as measured by the RAND tests, essay prompts on the Graduate Record Examination (GRE), and college GPA. Carini et al. (2006) analyzed data for four relationships:

1) The extent to which student engagement is related to experimental and traditional measures of academic performance
2) The forms of student engagement that are most closely related to student performance
3) Whether the relationships between student engagement and academic performance are "conditional," or vary depending on student characteristics; and
4) Whether certain four-year colleges and universities are more effective than others in converting student engagement into stronger academic performance

Data for the study were collected from the National Survey of Student Engagement (NSSE) survey, *The College Student Report, (*termed *The Report* hereafter*)*

and the RAND testing critical thinking and performance. GPA and SAT scores were obtained for most of the students in the 2002 field test. RAND items and *The Report* were administered to 1,352 students at 14 four-year colleges and universities fall and spring of 2002. Students with complete data numbered 1,058. The NSSE survey was administered in an untimed, non-standard method. Results of the study indicated positive correlations for student engagement with "desirable learning outcomes such as critical thinking and grades" (Carini et al. 2006, p. 23).

The correlations performed for RAND, GRE, GPA, and SAT scores showed relationships yet none had strong statistical correlations. RAND and GRE scores correlated with SAT at .48 and .55 respectively respective of the placement of students' scores in the distributions of each. First-year students correlated with SAT scores at .52 and .54, respectively. Performing a curvilinear specification between RAN and SAT showed higher SAT scores related to high RANT scores up to 1,434 on the SAT, the point at which a decline occurred in RAND scores (Carini et al., 2006).

Bivariate and partial correlations were performed between "student engagement scales RAND, GRE, and GPA measures and self-reported outcomes" (Carini et al., 2006, p.11). Small but statistically significant positive correlations between student engagement and scores on the RAND and GRE tests before and after student characteristics were added. No statistically significant negative partial correlations were revealed with GRE scores (Carini et al., 2006).

> Correlations for student engagement and GPA were computed and revealed "very modest but statistically significant positive partial correlations for 9 of 11 engagement scales including: level of academic challenge, active and

collaborative learning, student-faculty interaction, supportive campus climate, reading and writing, quality of relationships, institutional emphases on good practices, student-faculty interaction concerning coursework and integration of diversity into coursework" (2006, p.13).

None of the 15 scales examined were negatively correlated with GPA. Carini, et al. stated, "These relationships are almost certainly understated due to the lagged nature of cumulative rather than current semester GPA. Overall, the relationships between the NSSE scales, GPA, RAND, and GRE scores were comparable in strength" (Carini et al., 2006, p.13).

Carini, et al. (2006) reported regression findings from a separate analysis that regressed RAND, GRE, and GPA on student characteristics and SAT scores. These results "explained about 32% of the variance in RAND, 37% of the variance in GRE, and 13% of the variance in GPA (2006, p.13)." The researchers then used the three models to compute residuals for the students which represented "the amount of student over- or underperformance relative to predicted scores" (2006, p. 13).The negative residuals indicated if a "student underperformed relative to similar counterparts in the sample" (2006, p. 13). Finally, the researchers computed predictors into each of the equations by entering the dependent variables, residuals for RAND, GRE, GPA, and predictors of student engagement measures (Carini, et. al. 2006).

"These 11 engagement measures explained 2.9, 1.3, and 3.1% of the variance in the residuals for RAND, GRE, and GPA, respectively. When entered into the model separately, the most powerful predictors of RAND residuals were supportive campus

environment (1.8%), quality of relationships (1.8%), institutional emphases on good practices (1.0%), and reading and writing (.8%)" (Carini, et. al. 2006, p.13).

Carini also performed partial correlations to reveal associations between specific forms of engagement and higher academic performance among first-year student and seniors. Results of these analyses netted small positive significance for first-year students in the areas of gains in thinking critically and analytically (.15), general education (.15), institutional academic support (.12), discussed coursework outside of class (.14), worked harder than expected (.14), prompt feedback from faculty (.11), and prepared two or more drafts of a paper or assignment (.11). Greater statistical significance for first-year students were found (.16) for coming to class prepared, relationships with faculty, and administrative personnel and offices, and (.17) for number of papers of fewer than 5 pages (Carini et al., 2006)

In contrast to first-year students, partial correlations showed small statistical relationships (.18), for seniors in the areas of worked with other students in class, and quality of academic advising, (.20) for putting together ideas or concepts from different courses during class discussions, and (.16) for encouraged contact among students of different backgrounds and emphasis of attendance of campus events and activities. The strongest partial correlation for seniors was in the area of prompt feedback from faculty (.19) Carini, et al.'s analyses supported much of the existing research indicating, "student engagement is linked positively to desirable learning outcomes such as critical thinking and grades "(2006, p. 23) and also demonstrated that students experience changes in their forms of student engagement during the progression of that collegiate career, and occur as a result of many factors and influences. An interesting finding involved students with

lower SAT scores as they "appeared to benefit more from student engagement than those with highest SAT's" (Carini, 2006 p. 23).

A prominent study in the literature of student retention was conducted by Leticia Oseguera, seeking to examine the organizational characteristics that influenced the completion rates of African American/Black, Asian American/Asian, Caucasian/White, and Mexican American/Mexican/Chicana/o undergraduates over four and six year time periods. Oseguera asked, "To what extent do institutional characteristics influence four-year and six-year baccalaureate degree attainment…? "(2005, p. 206). Oseguera conducted the study for decision-making administrators of higher education institutions using Astin's Input-Environment-Outcome (I-E-O) model for evaluating student outcomes and Volkwein and Szelest's model identifying five organizational characteristics that can influence student outcomes. These five characteristics include: a) mission, b) size, c) wealth, d) complexity/diversity, and e) quality/selectivity. The researcher also includes the attributes of students' peers as a part of the institutional structure since these factors are also used to classify institutions. The purpose of Oseguera's study was to determine the extent to which the five institutional components influence the persistence of African American, Asian American, Caucasian, and Mexican American undergraduates (Oseguera, 2005).

The data used for analysis consisted of a sample of 303 baccalaureate-granting institutions who participated in the Cooperative Institutional Research Program's (CIRP) annual survey of entering freshmen in fall 1994. Degree attainment information was collected from institutions and the sample matched the students who completed the information with rosters provided. The matched samples were constructed to establish

distributions to mimic the institutions to which the students attended. The final participant group consisted of "2,210 African American students at 246 institutions, 2,874 Asian American students at 234 institutions, and 1,483 Mexican American students at 167 institutions, and 1,483 Mexican American students at 167 institutions, and twice the number of White students for each group (Oseguera, 2006, p. 26).

Independent variables used for the analyses included a) background characteristics, b) college-level experiences/environmental context variables, and c) structural characteristics of the institution. Chi-square tests were performed to test differences in degree attainment rates each of the racial groups. Blocked regression analyses evaluated the impact of the institutional characteristics on four and six-year degree completion rates. Having "nearly 50"(p. 26) freshman characteristics each regression conducted was terminated once no additional variable was able to produce an increase in the multiple regression of at least .001.Oseguera reported that even with this additional explained variance, all variables still netted highly significant coefficients ($p<.01$). Next, a second and shortened set of variables was created from the characteristics that had been input for any of the groups. Two regressions were then performed ensuring each equation contained the same independent variables for each comparison group allowing for equal comparison between each subgroup (Oseguera, 2006).

Oseguera's overall findings reflected that Asian American students attained degrees at similar rates to Whites. Black and Mexican American students attained degrees at significantly lower rates than their White counterparts. To further clarify the differences across groups, the five institutional characteristics were targeted for analysis. Computing comparisons of completion rates by institutional type, Asian students' four-year

attainment rates were "lower at public institutions and Protestant colleges" (Oseguera, 2006, p. 27). At six years, this gap was not observed. Black and Mexican students' attainment rates were statistically significantly lower for all institutional types than their White counterparts with one exception of the Mexican students at Protestant colleges. Regressions were run which enabled researchers to detect unique effects of institutional characteristics (Oseguera, 2006).

Results of the four and six-year regressions with the reduced number of variables resulted in these notable findings:

> a)high school grades and test scores were both positive predictors of degree completion for the Asian and White student sample, b) parental education level is a positive predictor for White students, c)parental income is a positive predictor for Asian students, d)institutional commitment is a positive predictor of degree completion for both but stronger for White students, and e)students' predisposition to academic integration is a stronger positive predictor of six-year degree completion for Asian students than for White students (Oseguera, 2006, p. 30).

The entering background characteristics regression analysis for White students and Black students revealed high school grades, standardized test scores, and initial commitment to the institution were stronger predictors of degree completion for White students. In contrast to these results, social integration, and volunteering during high school were stronger predictors of degree completion for Black students than for White (2006, p. 31).

The regression analysis for the variables addressing college environment and context revealed that living on campus enhanced completion rates for all four groups. Analyses for structural dimensions of the institution showed that the size of the institution had negative effects on four-year degree completion rates for all the groups. Oseguera reported one finding as "surprising (p. 33): the diversity/complexity variable had a borderline ($.01<p<.05$) negative effect for four-year completion rates for White students attending institutions with high proportions of students of color. Black students' rates were negatively correlated. However, when the block of institutional characteristics was controlled for, this negative correlation disappeared (Oseguera, 2006).

Analyses regarding mission and wealth characteristics revealed the following: "attending a public college or university reduces the student's chances of degree completion for all student racial groups… "(Oseguera, 2006, p.40). A higher level of degree offerings was a negative predictor for degree attainment for Black and White students. The measures for wealth characteristics, expenditures on instruction, student services, and academic support services, enhanced four-year degree completion rates for all groups. Faculty student ratios were negative predictors for completion for Black and White students (Oseguera, 2006).

Oseguera's last category of variables was peer group characteristics. All four groups' degree attainment rates were positively correlated with attending institutions where peers have higher socioeconomic levels for four and six-year degree attainment. Majoring in either Engineering or the Health Professions was a negative predictor of four-year degree completion for Asian, Black, or Mexican students (Oseguera, 2006).

Institutional Constructs

Although published studies provide retention models for individual institutions, other researchers have developed models to account for the variation across multiple institutions. Arredondo and Knight (2006) studied a single university's ability to predict its retention rates while Goenner and Snaith, (2004) focused on the unexplained broad differences of retention rates across doctoral universities. The purpose of their study was to "determine the relative importance of institutional characteristics on producing positive student outcomes and to allow better comparison of an institution's performance versus predicted values" (Goenner & Snaith, 2004 p. 411).Using multivariate regression analysis, Goenner and Snaith (2004) examined the aggregate graduate rates at "the four-, five-, and six-year time frame" (p. 411) for 258 Carnegie I research universities. Based on past findings of student retention studies, they identified eight institutional variables to analyze. The variables included: ,, percentage of students in the top 10% of high school class b) 25^{th} percentile of student SAT scores c) percentage of out-of-state students, d) average age, e) percentage of full-time faculty, f) educational and general expenditures, g) student-faculty ratio, and h) weighted tuition/fees (Goenner & Snaith, 2004).

Goenner and Snaith's their descriptive statistics found significant, positive relationships between high school rankings and SAT scores with graduation rates for the three intervals. Out-of-state status did not reveal a significant finding. Age was negatively related to graduation rates. Finally, the two faculty related variables and one expenditure variable only garnered significant statistics at the six-year graduation mark (Goenner & Snaith, 2004).

Astin, A. (2005) examined the effects of the Student Right-to-Know and Campus Security Act by comparing the retention and degree attainment rates of students who enrolled six years prior. Astin (2005) found that an institution's degree completion rate was primarily the reflection of its entering freshmen's characteristics. He concluded that degree completion rates differences across institutions is primarily attributable to differences among the student bodies at the time of entry. Astin (2005) did not recommend using the formulae for transfer or part-time students. His findings stated that more than two thirds of the variation in degree attainment rates can be attributed to differences in the students who enroll (Astin, 2005).

Student Characteristics and Family Background

The studies reviewed thus far have considered large models for predicting retention rates for institutional programs, prediction models based on bodies of research, and common student characteristics collected by college admissions offices. However, many studies focus on students whose identifying characteristics call colleges to construct more specialized approaches to student retention measures.

Duggan (2005) focused on the retention of first-generation college students. Students who do not have a parent who went to college have lower degree attainment rates in comparison to students who do have a parent with a college degree. In Duggan's study, he examined the impact of one form of social impact on first generation college students, email. The purpose of the study was to assist first-generation students and "inform leaders of the types of policy and institutional changes that are indicated, researchers, faculty, and administrators need to be knowledgeable of the factors that are most influential in first-year persistence" (Duggan, 2005, p. 170).

Email was chosen as one form of social capital. The hypothesis of the study assumed that students with email had higher levels of social capital and therefore, higher retention rates. Second, the study sought to define the role of email on persistence. Using data from the Beginning Postsecondary Students Database 96/98, Duggan (2005) studied the records of students who were enrolled as first-time, beginning students in four-year institutions. To compare students who were first-generation against students who were not, Duggan (2005) calculated cross-tabulations using first-year persistence as the dependent variable against eight other independent variables representing eight dimensions contributing to rates of persistence. Chi-square distribution was utilized to determine statistically significant differences.

1. First-generation students with e-mail had the same persistence rate as second-generation students with e-mail (p.179).
2. Having an e-mail account had a statistically significant positive effect on persistence (p.180).
3. First-generation students without email had probabilities of persisting that were 11% lower than students who used email (p.180).
4. Students in the full sample model who did not use e-mail had probabilities of persisting that were 14% less than those using e-mail (p. 80).

Students in the study were found to be less likely to persist if they did not have email (2005).

Another group of students who required targeted interventions to combat their poor retention rates were at-risk students. Engle, Reilly and Levine (2004) defined at-risk students as those whose GPA's fell between 1.25 and 2.00 on a 4.00 scale (p. 366). The

researchers drew upon an existing 12 week counseling program entitled, "Preparation for Achieving Scholastic Success" (P.A.S.S.). Retention related components of the program included group and individual counseling that addressed "both personal and academic issues" (Engle et al., 2004, p. 367), and was voluntary (Engle et al., 2004).

The quasi-experimental mixed design study tested four hypotheses.

1. Attrition was expected from both the P.A.S.S. and control groups; less attrition was expected from the participants in the P.A.S.S. program, while greater attrition was expected from the students in the control group.

2. P.A.S.S. participants' GPA's increased after the intervention, while the control group's GPAs did not

3. Self-reported study skills improved from early semester to late semester for the students in the P.A.S.S. program.

4. Self-esteem improved from early semester to late semester for the students in the P.A.S.S. program (p. 368).

The participants in the study were 91 predominantly white female students with an average age of 19, having completed less than 30 semester hours of study, who had either volunteered for P.A.S.S. or did not and were part of the control group. The independent variable was P.A.S.S. membership. The dependent variables measured in the study were GPA and attrition, scores on the Learning and Study Strategies Inventory (LASSI), and the Rosenberg Self-Esteem Scale (RSE) (Engle et al., 2004).

The results of Engle, Reilly and Levine's first hypothesis compared GPA and attrition in pairs of semesters and included two findings: 1) 69% of the P.A.S.S. participants vs. 43% of the control participants were in good academic standing at the conclusion of the

Spring 2000 semester and 2) 55% of the P.A.S.S. vs. 28% of the control participants remained in good academic standing at the end of the semester following the program (Engle et al., 2004, p. 372). A Chi-Square distribution was calculated and supported these findings. The second hypothesis was also supported as P.A.S.S. members' GPA's improved while the control groups' did not maintain initial increases and did not improve as much. The third hypothesis revealed that the P.A.S.S. group had an improved GPA that was maintained throughout the length of the study. The control group did not improve its GPA when compared through the entire study. The portions of Engle, Reilly and Levine's (2004) study which examined relationships between self-esteem and study skills using the Rosenberg-Self Esteem Scale and LASSI netted mixed results. However, students identified help with test taking skills, time management, and motivation as reasons for volunteering for P.A.S.S. participation (Engle et al., 2004).

While Engle, Reilly and Levine sought to measure students' grade point averages as they related to self-esteem and study skills, Hickman and Crossland (2005) chose to explore college students' coping skills as a means for successful adjustment to college. Predicting humorous coping skills was positively related to adjustment to college and "significantly associated" (Hickman & Crossland, 2005, p. 234) with birth order, family structure, humorous coping skills, GPA, and authoritative parenting styles, their study sought to explain the variance between identified factors. The sample for the study consisted of 257 students responding to a questionnaire distributed to students enrolled in freshmen Introductory Survey courses at a large Midwestern university. The participants had a mean age of 19.03, 65.4% were Caucasian, 20.6% Asian, 6.6% African-American,

and 7.4% were other students. Interestingly, 73.5% of the students had intact two-parent families (Hickman & Crossland, 2005).

To predict college adjustment, Hickman and Andrews (2005) examined six student characteristics: gender; ethnicity; family structure; birth order; mother's education; and father's education. The Parental Authority Questionnaire (PAQ) was administered to determine authoritative dimensions of parenting style. Means and standard deviations for each of the variables were calculated and used to construct a predictive model for college adjustment for first-quarter males and females. Stepwise multiple regressions were used to examine the variance across student characteristics (Hickman & Crossland, 2005).

Hickman and Crossland's (2005) results included:

1) Both males' and females' GPA and humor predicted initial academic adjustment to college,
2) For females, GPA and humor were predictive for initial social adjustment to college,
3) For males, humor and mothers' authoritative parenting styles were predictive of initial social adjustment to college
4) For females, humor and fathers' authoritative parenting style were predictive of initial personal-emotional adjustment to college
5) For males only humor was predictive of initial personal-emotional adjustment to college
6) For females, GPA, humor, and fathers' authoritative parenting style were predictive of initial commitment to college

7) For males humor and mother authoritative parenting style was predictive of initial commitment to college (2005, p. 235).

The parenting styles survey and regression analyses showed that "humor was more predictive of college adjustment and commitment for male college freshmen compared to female college freshmen" (Hickman & Crossland, 2005, p. 240).

Other researchers examined parenting styles of college students as they predicted students' academic success are Silva, Dorso, Azhar, and Renk (2008). These researchers conducted a study to examine variables of college students' development to better understand predictors of academic success. The sample consisted of 298 college students enrolled in advanced and introductory psychology courses. Specifically, "the study examined the relationships among the perceived parenting styles experienced by college students during their childhoods, college students' present levels of anxiety, their academic motivation, and their academic success (operationalized by their high school and college grade point average). …the value of the parenting styles experienced by college students during their childhoods, their anxiety, and their academic motivation in predicting college students' academic success when they were in high school…" (Silva et.al, 2008, p. 154).

The results of correlational analyses found: a) Students with fathers who had authoritative parenting had lower levels of anxiety, b) students with authoritative mothering styles had higher levels of anxiety, c) mothers with authoritative styles had significant positive relationships to students high school and college GPA'S, d) fathers' authoritative styles were positively related to high school GPA's but not college, and e)

high anxiety was related significantly and negative1y to high school and college GPA's and motivation (Silva et.al, 2008).

Kern, Fagley, and Miller (1998) examined attitudes about school, study and learning behaviors, test taking ability, attributions about responsibility for school success and school failure, and prior academic achievement. Kern et al. identified a significant correlation and a significant multiple coefficient of correlations between motivation, time management, and concentration with GPA (1998). When other variables were controlled statistically, five factors made unique significant contributions to GPA: ACT score, subscales addressing information processing, selecting main ideas, self testing, and focus (motivation, time management, and concentration). Kern et al. noted motivation was the only factor significant to GPA and retention in bivariate correlations (Kern, et. al., 1998).

An important college retention problem explored by Wells (2008) is the disparity between degree attainments rates of students from low socioeconomic (SES) backgrounds and minority groups with whites and higher socioeconomic classes. Minority groups with a low SES also have lower rates of degree attainment thereby decreasing the likelihood of progressing upwardly in social status. Wells (2008) purported that this disparity is growing. His study sought to examine the role higher education plays in social mobility and highlight this role for higher education institutions. Using the National Educational Longitudinal Study, Wells (2008) examined how students' "social and cultural capital" influenced their persistence in college and further tested for differences between racial and ethnic groups.

Wells (2008) followed a group of students identified in the 8^{th} grade of school. The students graduated from high school in 1992 and enrolled in a four year institution in

September of the same year. To determine the sample, only students persisting from their first year of college to their second were included. Students who did not enroll for the spring of the first year were included if they were enrolled the prior fall and post fall terms. Students who transferred to another institution were also included. After the sample was determined and a panel was applied, 1,310 cases were included in the sample for analysis. A limitation of the sample was stated as including an overrepresentation of whites, females and higher SES groups while African Americans and Hispanics were underrepresented (Wells, 2008).

Wells' analysis consisted of a determination of the students' initial levels of social and cultural capital. Descriptive statistic detailed differences between groups. A one way ANOVA revealed differences between specific aspects of social and cultural unique to racial and ethnic groups. The Scheffe post-hoc procedure was used to determine significant differences. To measure persistence, Wells used a logistic regression analysis to study the effects of social and cultural capital. The analysis was performed in sequential order for each independent variable in five separate blocks: race and gender, tuition costs, financial aid, students' work hours, and family income. In the third phase, standardized achievement scores in reading and math were tested to determine participation in high school college preparatory classes. The fourth phase examined institutional characteristics (private vs. public) and the fifth reviewed how social and cultural capital affected persistence (Wells, 2008).

Identifying aspects of social and cultural capital, Wells tested students' expectations of obtaining a degree, parents' expectations, students' peer and social groups' intent upon attending college, family resources, ACT or SAT scores and a measure of parental

involvement in a student's academic development (Cronbach's alpha =.82). Binary logistic regression was used to analyze each of the five models.

The results of Wells (2008) studied revealed differences in mean scores and standard deviations between racial groups. African Americans and Hispanics entered college with less capital than whites and other groups to which they were compared. Hispanics also had less parental education and resources than whites and Asians. No statistical significance was found on measures of student expectations, parent expectations, and the importance of college to peer and social groups using F-test on a one-way ANOVA. Wells' examination of persistence found one statistically significant variable: academic ability as measured by standardized reading and math scores (Wells, 2008).

Performing analysis of the coefficients of a logic model on the fifth group of variables measuring persistence, three factors showed positive correlations: one parent with a degree (172% higher odds of persisting); number of test preparation tools used; and amount of peers also planning to attend college (79% higher).Further, probabilities were computed and five variables were found to be significant in predicting persistence (Wells, 2008). These variables included higher standardized test scores, parents' education levels, college preparation, quality of high school attended, and peer groups' plans to attend college (Wells, 2008).

Finally, Wells performed an analysis by creating "ideal types" for comparison. Although this analysis yielded a trend that a higher level of social and cultural capital helped predict higher student persistence across all groups, race and ethnicity were less distinguished. Of these analyses, high levels of social and cultural capital positively affected persistence rates. Many limitations of this analysis were provided. In the

discussion of results, Hispanics entering college were identified as having less social and cultural capital. African Americans had higher levels of test prep tool usage. Asians were less likely to draw upon parental involvement compared to whites and Wells stated that, "whites and Asians have greater access to the forms of capital that are more commonly valued by higher education institutions (Wells, 2008)."

Intervention Strategies

First Year

Using data from the CIRP, Jennifer R. Keup (2006), explored the relationships between first-year seminars, service learning, and learning communities and first-to-second year retention. Keup found a statistically significant difference between students who participated in all three programs and those who did not participate in any of the three. All were associated with more positive first year experiences.

Glenn Potts, Brian Schultz, and Jacque Foust (2004) examined retention for a College of Business and Economics. Potts, et al. established freshmen cohorts of students taking English, math, and economics courses together (Potts, et. al., 2004). The results of their study found that:

- the level of faculty involvement made no statistical difference,
- ACT scores did not show significant differences,
- ACT scores did not show significant differences for GPA,
- ranking in their high school class was higher for students persisting for seven semesters,

- and living on campus showed a positive effect on retention for students who performed well academically their first semester (Potts, et. al., 2004).

The students who persisted had better GPA's; however, the GPA for students in the economics cohort was not statistically different from other cohorts. Overall, no evidence was found to support the assertion that participation in the cohort increased retention (Potts, et. al., 2004).

Another group of researchers, Kuh, Cruce, Shoup, Kinzie, and Gonyea (2008) also conducted a study to determine the effects of "institutional practices and conditions" upon student behaviors. Surveying 18 colleges and universities who participated in the National Survey of Student Engagement (NSSE) survey, they collected variables for 6,193 students from campus offices and student information systems including financial aid information, high school grades, college preparation test scores, and the measures captured through the NSSE survey administered to first year full time freshmen. Records that were incomplete were excluded. They analyzed the students' academic achievement in college by collecting cumulative grade point averages and persistence on student engagement. The team defined student engagement by measuring the level of NSSE survey responses to the items addressing "time on task and engagement in educationally purposeful activities" (Kuh et al, 2008, p.545).

The National Survey of Student Engagement (NSSE) annually administers its survey, "The College Student Report", to students at participating universities. The NSSE measures how undergraduate students spend their time and how they benefit from enrollment. Comparison reports are provided and papers are published on the findings. The NSSE examines and reports the trends observed in its findings. NSSE was first

administered in 2000 and has since enjoyed 1,493 participating institutions and 2.7 million students. In 2011, 393,630 students across 761 higher education institutions participated (National Survey of Student Engagement, 2011).

The analyses conducted by Kuh and company took place in two stages. The first operation utilized was logistic regression measuring the effect of high school grade point average and activities, college preparation test scores, and academic engagement on first year persistence. The second phase of analysis sought to determine the interactional effect of background characteristics and demographics on engagement, cumulative grade point average, and persistence by entering "cross-product variables into the general effects equation" (Kuh, et al, 2008). The results revealed that background characteristics accounted for 29% of the variance found in predicting college GPA and the strongest influence. Upon adding student engagement variables, the predictability of performance was lessened however was still found to be statistically significant. One demographic variable, parents' education, lost its effect in this second phase of analysis. Kuh et al. (2008) concluded that:

"…student engagement in educationally purposeful activities is positively related to academic outcomes…." and the benefit of academically purposeful activities has an even greater effect for "lower ability students and students of color compared with White students" (Kuh et al., 2008, p. 551).

Advising, study skills development, active learning

Anna Lowe and Michael Toney. (2000) sought to determine if retention rates for a teacher preparation program were affected by student satisfaction with advising. The variables identified included: advisor type, status of student (undergraduate vs. graduate),

and frequency of contact with advisor. A significant relationship was found between satisfaction and frequency of contact with advisors and between satisfaction and college enrollment. There was no relationship between the types of advisor by the student status. No significant differences were observed between undergraduate and graduate students and their retention rates (Lowe & Toney, 2000).

Early Warning System

William E. Hudson (2006) studied the effect a warning system for excessive absenteeism had on retention. Hudson stated the educational issue saying, "The ability of our institutions to retain students remains a difficult challenge" (p.218). The research problem was, "It is estimated that more than 20% of freshman students who fail courses do so as a result of excessive absenteeism during the first 4-6 weeks of the semester" (Hudson, 2006, p.218). The hypothesis of the study was the assumption that a tracking mechanism would reduce absenteeism. It was stated as, "The results of this reporting system are expected to reduce excessive absence rates" (Hudson, 2006, p. 219). The study was conducted at Morehead State University, located near the Appalachian Mountains and at the foothills of the Daniel Boone National Forest. The target population was 2,378 freshmen enrolled in the spring semester.

To determine the study group, past enrollment, pass/fail grades from transcripts, and withdrawal rates were reviewed. Students determined as having excessive absenteeism rates numbered 216 freshman students taking twelve or more semester hours and enrolled in a developmental education course and an entry level course for a specific major. Freshmen attendance rates, numbers of meetings, and grade point averages were evaluated. They included the number of students who were identified and contacted, the

number of advisors who made appointments with the students, and the scores and final grades for the courses as well as number of passes, fails, and withdrawals in the courses (Hudson, 2006).

The percentage of students who responded to advisor contacts and their final grades/enrollment statuses were reported (Hudson, 2006). "85% of the students reported for absenteeism responded to the contact attempts of advisors. 48% of the students who were reported passed the courses. 33% failed. 15% dropped" (Hudson, 2006). Since the average pass/fail/withdrawal rates were not included, it is difficult to determine whether the implementation of the system was successful or not. Hudson states that the system was instrumental in facilitating contact between advisors and students. However, the baseline numbers recorded prior to implementation of the pilot were not reported leaving the reader with little confidence that the rates of absenteeism or academic achievements were improved. He also reported the surprise that students expressed upon realizing the institution was monitoring their attendance (Hudson, 2006).

Summary

In the review of literature, three areas were highlighted as being predictive of students' likelihood to continue enrollment and/or obtain a degree within a four or six-year time period. They were:

- institutional approaches to retention;
- family background and demographics;
- and prior academic preparation.

The studies were conducted across single institutions and multi-campus sites.

The institutional commitment variables demonstrating positive and significant strengths across retention studies included the implementation of

- first year courses for freshmen,
- study skills instruction, and
- summer bridge programs targeting at-risk students as reported by Ryan and Glenn (2003);

Oseguera (2006) and Carini et.al (2006) discussed mechanisms conducive to creating supportive campus environments. These strategies included

- designing a curriculum with an emphasis on student engagement activities such as courses incorporating service-learning, undergraduate research, study abroad, and freshmen learning communities as noted by Keup (2006) and Kuh (2006);
- emphasizing student services and support and monitoring student advising as reported by Lowe and Toney (2000);

- implementing programs targeting students who are at-risk of dropping out or having academic difficulties observed by Engle and Levine (2004) and (Hendel, 2001); and
- promoting on-campus housing options for students noted by Potts, Schultz and Foust (2004) and Astin (2005).

The family background and social capital characteristics found to be significant predictors of retention included

- parents' level of education, reported by Oseguera (2006), Duggan (2005) and Wells (2008);
- caregivers' authoritative parenting styles described by studies conducted by Hickman and Crossland (2005) and Silva, Dorso, Azhar and Renk (2008);
- entering student characteristics described by Astin (2005); and
- peers' expectations of attending college as observed by Wells (2008) and Astin (2005).

Finally, the academic preparation of students as reflected by their college entrance exam scores, high school rankings, and high school grade point averages were reported as positive predictors of retention and were noted in institutional, multi-campus, and longitudinal studies conducted by Hendel (2001), Potts, Schultz and Foust (2004), Oseguera (2006), Goenner and Snaith (2004), Hickman and Crossland (2005), Kern, Fagley and Miller (1998), Wells (2008), and Astin (2005).

3 RESEARCH DESIGN

Quantitative Research and Logistic Regression

Tinto's theory of individual departure called for universities to analytically examine student interactions and outcomes associated with the institutional programs offered on college campuses (Tinto, 1993). This called for colleges to conduct quantitative research that "highlights the ways in which the social and intellectual communities that make up a college come to influence the willingness of students to stay at that college" (p. 104). The purpose of this study was to determine the variables that predicted the likelihood of students remaining enrolled in college. The three categories of variables that were examined were a) family background and demographics, b) institutional constructs, and c) academic preparation and performance factors. The independent variables for family background and demographics were age, unmet financial need, Pell eligibility, ethnicity, gender, and first generation. The independent variables for institutional constructs were advising appointments, early alert notices, change of major, student engagement and freshman year experience courses, and honors programs. Last, the independent variables examined for academic preparation and performance were ACT Composite, cumulative grade point average (GPA) and high school GPA. The dependent variable was continued enrollment in college. The site selected for study was a large, public, urban, very high research activity institution. A quantitative study using logistic regression was conducted to analyze the relationship

among the variables and their ability to predict the likelihood of the outcome variable of remaining enrolled.

Research Design

Hosmer and Lemeshow explained that logistic regression models are commonly used to analyze the relationships between response variables and multiple "explanatory variables" (2000, p. 1). The study sought to explore the relationship between three groups of variables and their ability to predict retention. The three groups included student characteristics (Family Background and Demographics), (Academic Preparation and Performance), and student participation in institutional offerings and support services (Institutional Constructs). Examining the ability of the variables to predict continued enrollment would serve to inform the institution as to what programs encouraged the retention of students. Logistic regression analysis was chosen because the technique allowed the examination of many independent variables and their strength of influence on a binary dependent variable (continued enrollment in college or leaving) (Creswell, 2005; Hosmer & Lemeshow, 2000).

Population

This study examined data collected for a population of students entering a four year college without prior enrollment at a higher education institution. The population targeted for study was the class of undergraduates entering the institution in the Fall of 2007. This particular population, first-time full-time freshmen, was chosen for study because the Student Right-to-Know and Campus Security Act (P.L. 101-542) requires universities who receive Title IV funding to report the retention and graduation rates of

the cohorts. This data must be submitted to the Department of Education and made available to the public annually (Integrated Postsecondary Education Data System Glossary, 2012).

Creswell defined the term, "population" as a group of individuals who have the same characteristic (2008). The definition for first-time full-time students used by the National Center for Education Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS) is:

> A student who has no prior postsecondary experience attending any institution for the first time at the undergraduate level… it …includes students enrolled in the fall term who attended college for the first time in the prior summer term, and students who entered with advanced standing (college credits earned before graduation from high school) ("IPEDS Glossary," n.d.).

The National Center for Education Statistics publishes the retention rates for first-time freshmen on its public website. The IPEDS method for determining retention rates is defined as:

> A measure of the rate at which students persist in their educational program at an institution, expressed as a percentage. For four-year institutions, this is the percentage of first-time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions this is the percentage of first-time degree/certificate-seeking students from the previous fall who either re-enrolled or successfully completed their program by the current fall ("IPEDS Glossary," n.d.)

Site Selection

The institution selected for the study of retention rates was targeted for a number of reasons. First, improving the retention of undergraduates had been made a priority by upper administration based on the low rates of degree completion. The retention and graduation statistics for defined cohorts of entering freshmen were not commensurate with the rates of the institution's peers. According to the NCES IPEDS Data Feedback Report 2010, in comparison to its peers, the campus had markedly higher proportions of

- women (60% vs. 52% for peers);
- Black or African American students (21% vs. 7% for peers); and
- Federal grant (25% vs. 19%) and Pell grant award (25% vs. 18%) recipients (IPEDS Data Feedback Report, 2010, p. 3-4.)

The degree attainment rates for undergraduates and entering students were also disproportionate.

- Among first-time full-time undergraduates, (14% vs. 19% for peer institutions) obtained degrees within four years while
- entering students completed programs of study at a rate of (55% vs. 72%) of the same population enrolled in peer institutions (IPEDS Data Feedback Report, 2010, p. 5).

Also, the institution's time to award degrees was protracted when compared to peers. The rates of program completion were lower for first-time, full-time, undergraduates as the

- four-year time to program completion was (14% vs. 36%);
- the six-year time to program completion was (38% vs. 63%),

- and the eight-year time to program completion was (42% vs. 68%) based on the median rate for each (IPEDS Data Feedback Report, 2010, p. 5).

In reaction to the lagging retention rates, a strong emphasis on addressing the issue of retention emerged. In 2005, the institution prepared its Quality Enhancement Plan (QEP) in response to two events:

1) a 1994 legislative state mandate ordering the revision of the core curriculum for all public institutions of higher education in the state was scheduled for implementation in 1998; and

2) the Southern Association of Colleges and Schools (SACS) released its accreditation audit containing a recommendation report for the institution (Kurata et.al, 2005).

Assembled by a university committee comprised of faculty, staff, and administrators and chaired by faculty member, Marilyn Kurata, Ph.D., the QEP outlined programs addressing retention and student engagement as a means by which to improve student outcomes. Portions of the QEP introduced the concept of freshman learning communities and emphasized writing, quantitative literacy, and ethics and civic responsibility. The initiative was carried out in conjunction with a university-wide initiative for redefining the university's strategic plan (Kurata et. al., 2005).

Last, much of the research focusing on retention highlighted the first-year freshman student population. As Tinto explained, the majority of student departure from higher education occurs in the first year (1993, p. 14). However, few studies have tracked groups beyond the second year of enrollment. Since the purpose of the study was to determine the student characteristics and institutional constructs that predict retention,

examining a population with common circumstances gave some modicum of protection from a wide range of variance occurring across the data. It also provided the opportunity to observe the effects of the institutional offerings distinct to the university (Creswell, 1993).

The university's uniqueness was highlighted in the Carnegie Foundation's database of higher education institutions. Based on data from 2008 to 2010, the Carnegie Foundation categorized the campus with the following criteria:

1. Level: 4-year or above;
2. Control: public institution;
3. Student population: 16,874;
4. Undergraduate instructional program: balanced arts and sciences with professions and a high graduate coexistence;
5. Graduate instructional program: doctoral with science, technology and mathematics majors being dominant;
6. Enrollment profile: majority undergraduate;
7. Undergraduate profile: medium full-time four-year, selective, and higher transfer-in;
8. Size and setting: large, four-year, primarily nonresidential; and
9. Basic Carnegie category: research activity signifying very high research activity.

The elective classifications for the university were:

10. Curricular Engagement and Outreach and Partnerships.

Completing a query to select similar institutions using the Carnegie Foundation's web database lookup tool entitled, "Custom Lookup" it was found that when selecting all ten categories, no other university in the database was identified as a peer ("Carnegie Foundation for the Advancement of Teaching", 2011).

The retention and graduation rates being out-of-line with peer institutions supported Tinto's description of urban schools. He entitled a section of his 1993 publication with, "The Urban College: A Category unto Itself" (p.197). Although he acknowledged colleges in urban settings had a distinguishing set of challenges, he recommended the study of the approaches proving to be successful on other urban campuses and the evaluation of retention efforts within (Tinto, 1993).

Data Collection

The institution began constructing a set of data for the purpose of studying college retention issues in 2007. To formally conduct research using the data, an exemption review was requested from the Internal Review Board (IRB). The exemption was granted with a caveat note stating that though the data were regularly collected as a function of institutional practices, it was not collected for the purposes of research and was therefore subject to the oversight of the IRB.

The Information Technology staff provided a dataset for analysis which spanned four academic years beginning Fall 2007 through Spring 2011. The data were electronically delivered via a password-protected file retrieval system. It was housed on university servers and pc's protected by encryption software. A unique login and password was required to access the computers and the data files. The dataset consisted of anonymous student records for 1,368 students. The information was collected from a

variety of campus systems utilized during the process for application to admission to enrollment. It contained demographic information, record of participation in targeted programs, academic attributes related to academic preparation and performance, financial status, and enrollment in courses. It also provided information about on-campus housing, advising visits, and participation in academic support services.

The data collected spanned a four-year time period beginning Fall 2007 and ending at the close of Spring 2011. This time period of four academic years is consistent with the NCES definition for Graduation Rate (GR).

> This annual component of IPEDS was added in 1997 to help institutions satisfy the requirements of the Student Right-to-Know legislation. Data are collected on the number of students entering the institution as full-time, first-time, degree/certificate-seeking undergraduate students in a particular year (cohort), by race/ethnicity and gender; the number completing their program within 150 percent of normal time to completion…GR automatically generates worksheets that calculate rates, including average rates over 4 years ("IPEDS Glossary," n.d.)

The IPEDS definition of, "normal time to completion" is, "typically four years (eight semesters… in a standard term-based institution…" ("IPEDS Glossary," n.d.).

Appendix A provides the complete data dictionary of terms contained in the dataset.

Error checking and Data Preparation

Once the data were received, a host of measures were used to screen for errors and pinpoint critical factors. The data collected consisted of over 200 separate columns of

values for the 1,368 student records. The exorbitant amount of data necessitated identifying the variables most needed for testing the research questions and met Hosmer and Lemeshow's definition of "overfitting" a model (Hosmer & Lemeshow, 2000, p.92).

The outcome variable, retained, denoting students who returned for the subsequent Fall was "dummy coded" with a "1" and "0". Students who enrolled for at least one credit hour or more for each subsequent fall term in 2008 and 2009, and 2010 were coded as being retained. Since the data ended at the close of Spring 2011, students enrolling in one or more credit hour of instruction for that term were also coded as being retained.

The data also consisted of text responses. Variables with text field responses were recoded to assign "1's" and "0's" as an expression of the presence or nonpresence of the variable as recommended by Hosmer and Lemeshow (2000). In some situations, columns were completely blank as the codes for these variables were not in place for Fall term, 2007. The program used for the data analysis was IBM SPSS Statistics 19. The program required that all data be numerical. Therefore, all text responses were "dummy-coded" for use with the software (Pallant, 2007, p. 13).

Frequency statistics were computed and reviewed. The sample data consisted of 1,368 freshmen. Of these students, 1187 were age eighteen, 848 White, 334 Black, and 186 Asian, Hispanic, American Indian, Multi-racial, or did not report a race or ethnicity. There were 800 females and 545 males. The financial status of the students as determined by the Free Application for Federal Student Aid (FAFSA) information was reported through two measures, Pell Grant Eligibility and Unmet Financial Need. The Unmet Financial Need category was a result of a calculation whereby the expected family

contribution plus the amount of institutional and federal aid awards was subtracted from the cost of tuition and expenses. Of the entering students, 407 were Pell Eligible. Freshmen choosing to live on-campus in the first Fall numbered 823. See Appendices B and C for the tables presenting these results.

Table 1 displays the frequencies and percentages for the categorical variables.

Table
1. Descriptive Statistics of All Entering Freshmen Fall 2007

Category	Type	N	%
Age	Eighteen	1187	87.00
Ethnicity	White	848	62.00
	Black	334	24.00
	Multi-racial, American Indian, Hispanic, Asian, other	186	14.00
Gender	Female	800	58.00
	Male	545	40.00
Financial Status	Pell Eligible	407	30.00
	Need based grants	370	27.00
Residence	On campus	823	60.00
	Total	1,368	100.00

In the frequencies a number of issues were observed. In one example, the variables within the category of financial aid consisted of seventy-one separate columns. Many of these were either blank or contained information which served as a portion of other variables that had the potential for serving as more complete and appropriate descriptors of the measure for financial status. In others, there were few cases having the attribute. In approaching the task of cleaning the data, Hosmer and Lemeshow (2001) recommended “minimizing” the number of variables to better ensure a mathematically stable model (Hosmer & Lemeshow, 2000, p.92). The strategies Hosmer and Lemeshow recommended included collapsing independent variables to eliminate zero cells, coding measures to construct continuous variables, and removing categories that were obviously

unneeded or redundant (2001). Where necessary, columns were selected within a category or frequency counts combined then converted to categorical variables (Hosmer & Lemeshow, 2007).

The frequency testing also revealed a number of cases with incomplete data. Table 2 provides an overview of the 22 cases that were dismissed from analysis due to missing values.

Table
2. Description for Cases Removed due to Missing Values

Variables	*N*	Justification
ACT Composite Score	4	Consistently used as a measure for college preparation and a factor widely discussed in college retention literature (Astin & Oseguera, 2002; Kern, et. al., 1998; Potts, et. al., 2004; Tinto, 1993; Wells, 2008).
Credit Hours Attempted Fall 2007	5	Blank cells in these records indicate the students either withdrew or did not actually attend. The cases in question did not appear in subsequent terms recorded in the dataset.
Primary Ethnicity	2	Frequently a factor examined for its role in college retention and discussed in the literature review (Astin & Oseguera, 2002; Hendel, 2007; Hickman & Crossland, 2005; Wells, 2008).
High School GPA	11	Prediction models frequently included high school GPA as a predictor of retention. Ryan and Glenn, 2003; Astin, 2004; Arredondo and Knight, 2006; and Silva e. al., 2008 each utilized the measure.
Total	22	

The average age of the 22 cases dismissed due to missing data was 19. The average ACT Composite score was 23. Six of the students were Black, 10 were White, 2 were Asian, 1 had an Unreported ethnicity, and 1 was Multicultural. There were 4 with missing ACT Composite scores, 5 had zero hours attempted Fall 2007, 11 were missing High School GPA's, and 2 were missing a value for Primary Ethnicity. After the 22 cases were dismissed, the data consisted of 1,346 unique cases.

Stop-outs

During the testing phase of the data, a pattern was found whereby certain students were not returning the subsequent Fall but instead, enrolling in a later term. In the first year, ten students did not return Fall 2008. However, they returned Fall 2009. One student from the Fall 2007 group, obtained a degree and therefore was not "retained" by definition in subsequent years. Stop-outs were coded as "retained" if they enrolled in a term following the fall term for which they were not enrolled

The descriptive statistics for stop outs" are displayed in Table 3.

Table
3. Descriptive Statistics for Ten Students Not Enrolling for Subsequent Year

Continuous Variables	*M*	*SD*
Academic Preparation and Performance		
ACT Composite	24.00	2.85
High School GPA	3.51	.55
Cumulative GPA	2.19	1.20
Family Background and Demographics		
Age	18.00	.32
Unmet Financial Need	3,409.10	4,260.12
Institutional Constructs		
Advising Appointments	1.90	1.30
Changed Major(s)	.10	.32
Early Alerts Received	.90	.74
Supplemental Instruction	.00	.00
Categorical Variables	*n*	%
Family Background and Demographics		
Gender- Female	6.00	60.00
Ethnicity- White	7.00	70.00
First Generation	2.00	20.00
Institutional Constructs		
On Campus Housing	4.00	40.00
Student Engagement	.00	.00
Took University 101	.00	.00

For the complete list of independent variables and the corresponding descriptive frequencies, see Appendices B and C.

After dismissing cases for missing data, the dataset contained 1,346 students. The final phase of the preliminary analyses consisted of preparing the file for IBM SPSS Statistics 19. When the data were free of missing cells and relevant variables selected, descriptive statistics were computed. The population for this study included all students entering the institution in the Fall semester of 2007 that had no prior enrollment or completed credit hours from a two-year or four-year degree-granting or certificate-granting institution.

Model Building

The next step taken was to select variables to include in the logistic regression equations. Hosmer and Lemeshow (2000) stated,

> The goal of an analysis using this method… is…to find the best fitting and most parsimonious, yet biologically reasonable model to describe the relationship between an outcome (dependent or response) variable and a set of independent (predictor or explanatory) variables (Hosmer & Lemeshow, 2000, p. 1).

Tinto (1993) noted that many factors influence a student's decision to leave college. The variables chosen for measurement addressed specific areas of the relationships between the internal programs offered and required curriculum components unique to college campuses and "external forces and external choices" which may draw students away (1993, p.109). In the literature review, the variables discussed fell into three broad categories. These categories were:

- academic preparation and performance,
- family background and demographics,
- and institutional constructs.

The independent variables collected included:

- advising appointments;
- early alert notices,
- academic engagement courses,
- participation in honors programs,
- on-campus housing,
- change of major,
- supplemental instruction, and
- freshman year experience programs.

The variables collected to analyze student demographics and family backgrounds included

- age,
- ethnicity,
- gender,
- first generation status,
- unmet financial need, and
- Pell Grant eligibility.

Finally, the independent variables for academic preparation and performance were

- ACT Composite scores,
- High School GPA, and
- Cumulative GPA.

Table 4 lists the independent variables selected for the logistic regression models and provides the role and description of each. The dependent variable was Retained. It

was assigned a binary value of “0” or “1”. Cases not attempting credit hours in the second and third fall and/or the fourth spring were coded with a “0” for Retained. Cases attempting credit hours in these semesters were assigned a value of “1” for Retained.

Table
4. Description of Independent Predictor Variables by Category

Category	Description
Academic Preparation and Performance	
ACT Composite	Scale value (16-35) The highest composite score on the ACT reported for the student
High School GPA	Scale value (1.82-5.28) Cumulative GPA as reported from high school transcript.
Cumulative GPA	Scale value (0-4.0)
Family Background and Demographics	
Age	Scale value (16-38) Age of the student at entry.
Ethnicity	Binary value – Student reported White (1) or Black, African American, or other ethnicity (0)
First Generation	Binary value- The student does not have a parent with a college degree (1) or does (0).
Gender- Female	Binary value- The student is female (1) or is male or did not report (0).
Institutional Constructs	
On-Campus Housing- Year One	Binary value- The student lived in campus housing (1) or did not (0).
On-Campus Housing-Year Two, Three and Four	Scale value for Year Two, Three, and Four Range 0-4
Honors	Binary value- The student participated in a campus-wide honors program (value = 1) or did not (0).*
Advising	Scale value- (0-34) The student attended appointments with an academic advisor. Count of visits per year and cumulative total per year.*
Change of Major	Scale value- (0-40) Count of the number of instances whereby the student formally changed the choice of major either electronically by using the student information system or by submitting a paper form. Count of major changes per year.
Supplemental Instruction	Scale value (0-110) The student attended supplemental instruction sessions. Count of sessions attended each year and cumulative total each year.*
University 101 or Freshman Year Experience	Binary value- The student completed a course noted as a freshman year experience course (value =1) or did not (value=0).P
Math 098	Binary value- The student completed the college algebra course, mathematics 098 (value = 1) or did not (value = 0).P
Student Engagement	Scale- Count of the number of Service Learning, Undergraduate Research, or Study Away courses completed.*
Early Alert	Scale value (0-110)- Count of the messages issued to student through the campus notification system for contacting students not doing well in courses.*

*see additional descriptions of variables to follow

*Variable definitions

Honors Program- The institution has five specialized honors programs available to incoming freshmen. Students apply and interview for the competitive programs during the application process. Membership in an honors program may preclude the requirement to enroll in a Freshman Year Experience course. The programs offer students small group settings, special study space, and interactions with tenured faculty and support staff who direct the programs ("2006-2008 Undergraduate Catalog", 2012).

Student Engagement- Tinto noted that promoting student-faculty interaction in various settings is an important aspect of student retention (1993). The campus offered three types of courses distinctly tailored to encourage these conditions. They were Service Learning, Study Away, and Undergraduate Research. In isolation, the number of students taking these courses was not robust enough to include in the model. As discussed previously, Hosmer and Lemeshow cautioned researchers to monitor sample sizes to ensure a stable mathematical model (Hosmer & Lemeshow, 2000, p. 347). To include variables that met the guidelines for achieving a best fit, the instances of students taking Service Learning, Undergraduate Research, and Study Away courses were combined to create a scale independent predictor variable labeled, "Student Engagement."

Supplemental Instruction (SI) is an "academic assistance program" that is an organized study group led by a student who has been trained to facilitate work sessions to reinforce the content delivered in classes. The SI component was available for courses identified as difficult for freshman and sophomores. The content areas addressed included Biology, Chemistry and Psychology. Participation in SI sessions was completely

voluntary. The student data held a record of attendance for students participating in SI sessions ("The Division of General Studies," 2011).

University 101 and FYE- The University 101 course was a three-hour course which was originally intended to provide instruction in techniques for studying and the use of critical thinking skills (The Division of General Studies, 2010, p. 7). Some of the course components included activities for developing improved critical thinking skills, study skills, time management, and other success strategies for students. Three areas of concentration driven by the QEP were also addressed which included Quantitative Literacy, Oral and Written Communication, and Civic Responsibility (Kurata et.al, 2005). Originally a course targeted toward students who were conditionally admitted to the university, the University 101 course evolved to include the six competencies required for Freshman Year Experience (FYE) courses. Completing University 101 satisfied the requirement to complete an FYE for students entering the university with less than 25 hours of transfer credit (Undergraduate Catalog, 2010). Due to the shared nature of the goals and competencies for FYE's and the purpose of University 101 courses, the two variables were combined to create a categorical variable.

Freshman Learning Communities (FLC's) were the initial freshman experience construct enacted through the implementation of the QEP and began in 2006. The dataset contained suspect counts for the FLC's whereby only two students were reported to have enrolled in an FLC in 2007, none in 2008 and so on. This was out of balance with campus reports reflecting a count of 147 students in 2006 and 406 in 2008. Therefore, the variable was not included in the model (Kurata et.al, 2005, p. 106).

Mathematics 098- Math 098 was a college algebra course offering three credit hours that did not apply to the completion of a degree. First-time students entering the university were placed in the math course if their ACT mathematics subscore was below a 20 (Math Matrix). The course was also a prerequisite course for upper-level courses in math thereby requiring students placed in this to successfully complete it before moving into other courses in mathematics. See Appendix D, the Math Matrix, to review the placement rules.

Subsets

Once the data were free from blank cells, the data files were grouped and labeled to create four subsets by year of enrollment. This allowed the analysis of relationships among the variables confined to each academic year. These files were labeled, Year One, Year Two, Year Three, and Year Four. This strategy was commensurate with Goenner and Snaith's 2004 study whereby they examined the retention of doctoral students by tracking graduation rates at the four, five, and six-year marks providing an opportunity to examine the expression and influence of traits unique to each year (Goenner and Snaith, 2004).

The final consideration for the variables was sample size. Lemeshow and Hosmer recommend the use of 'events per parameter' for large, complex data sets. This equation was expressed as:

$p+1 \leq \min(n1, n0)$ /10 parameters (Hosmer & Lemeshow, 2000, p. 346).

Hosmer and Lemeshow recommended grouping variables when the frequency was too small in comparison to the sample size. The recommendation was to have a sample size with at least ten events per variable. In this dataset there were 1,346 cases possessing 15

variables. This proportion met the criteria for an acceptable sample size to perform a logistic regression (Hosmer & Lemeshow, 2000, p. 347).

Predictor variables that did not comprise at least ten percent or more of the population were not included in the logistic regression models. The predictors that were excluded from Year One were Engagement Courses, Honors, and Supplemental Instruction. Honors and Supplemental Instruction were included in the models for Years Two, Three, and Four. Engagement was included in the models for Year Three and Four. Hosmer and Lemeshow (2000) described this beginning level of model-building for logistic regression in this way, "Successful modeling of a complex data set is part science, part statistical methods, and part experience and common sense" (Hosmer & Lemeshow, 2000, p. 91).

Correlation Studies

Hosmer and Lemeshow (2000) next recommended computing correlations to further evaluate the variables to include in logistic regression equations. To test the direction and strength of the relationships among the continuous variables, correlation matrices were constructed.

As cited in Pallant (2007, p. 132) Cohen recommended determining the strength of the relationships by evaluating the correlation coefficients. Variable pairs with a correlation coefficient between .10 and .29 exhibited a small level of association. Variables with a correlation coefficient between .30 and .49 had a medium level of association. Correlation coefficients between .50 and 1.0 indicated a large level of association (Pallant, 2007).

The results of the correlations revealed that in Year One, twenty-one of the sixty four correlations were significant. In Year Two, thirty-four of the ninety correlations were statistically significant. The correlations for Year Three predictors found thirty-three correlations to be statistically significant and in Year Four, twenty-seven of eighty-one correlations were statistically significant at the .01 and .05 levels. Across the four years examined, 34% of the 335 correlations were statistically significant. Five of the correlations were large. The correlation coefficients for High School GPA and ACT Composite were .565 .583, .579 for Year Two, Three and Four, respectively. The correlation coefficient for Early Alert and Cumulative GPA were negatively correlated with a correlation coefficient of -.561 in Year Three. See Appendix E, F, G, and H.

For the purposes of performing logistic regression calculations, Pallant recommended correlation strengths of .3 or better between independent variables. She cautioned that "two variables with a bivariate correlation of .7 or more" should not both be included in a logistic regression model. (2007, p. 155). When this result was observed, the two variables should be combined into a single composite variable or one be excluded from use in logistic regression models (Pallant, 2007).

Multicollinearity

Multicollinearity was another issue that needed to be addressed. Multicollinearity occurs when two or more independent variables are essentially measuring the same behavior. Large standard errors of one or more and bivariate correlation values greater than .7 and less than .1 are indicators of this effect. Although a large number of variables demonstrated correlations, none were greater than .7 and were therefore, not dismissed from use in the models (Hosmer & Lemeshow, 2007) (Pallant, 2007, p. 141).

Chi-square correlation statistics were computed to assess the relationship between categorical variables. Nineteen of the correlations between the 49 relationships examined among the categorical variables were significant for Year One. The measures that were negatively correlated were Female with White and First Generation; Honors with Math 098; Housing with White, First Generation and Math 098; Freshman Year Experience and White; and Pell Eligible with White and Honors. Positive correlations were found between First Generation and Math 098; On-Campus Housing with Female and Honors; Freshman Year Experience with First Generation and Math 098; and Pell Eligible with Female, Math 098, On-Campus Housing, Freshman Year Experience. Table 5 displays the results of the correlations and the significance.

Table
5. Correlations of Categorical Variables for Year One

				Correlation			
Measure	First Gen	Female	Honors	Math 098	Housing	Freshman Exp.	Pell Eligible
White	.024	-.075	-.026	-.015	-.206	-.070	-.333
First Gen		-.058	-.040	.073	-.063	.056	-.001
Female			-.004	-.026	.126	.021	.094
Honors				-.067	.153	.053	-.088
Math 098					-.119	.068	.049
Housing						-.020	.090
Freshman Exp.							.097
				Sig. (1-tailed)			
White	.191	**.003	.169	.293	**.000	**.005	**.000
First Gen		*.017	.073	**.004	**.010	*.019	.486
Female			.441	.172	**.000	.222	**.000
Honors				**.007	**.000	*.026	**.001
Math 098					**.000	**.006	*.035
Housing						.226	**.000
Freshman Exp.							**.000

Note: **Correlation is significant at the 0.01 level (1 tailed)
*Correlation is significant at the 0.05 level (1-tailed)

Nine of the 36 correlations were significant for Year Two. Positive correlations were found between Freshman Year Experience with Math 098; Math 098 with First Generation; and Pell Eligible with Freshman Year Experience. Negative correlations were found between Female and White; Math 098 and Female; Freshman Year

Experience and White; and between Pell Eligible and White and Honors. Table 6 displays these results.

Table
6. Correlations of Categorical Variables for Year Two

Measure	First Gen	Female	Math 098	Freshman Exp	Honors	Pell Eligible
			Correlation			
White	.037	-.061	-.004	-.051	-.016	-.360
First Gen		-.029	.069	.046	-.036	.004
Female			-.056	-.020	-.009	.076
Math 098				.052	-.035	.010
Freshman Exp.					.045	.081
Honors						-.095
			Sig. (1-tailed)			
White	.109	*.021	.446	*.046	.303	**.000
First Gen		.167	*.011	.066	.116	.443
Female			*.033	.253	.387	**.006
Math 098				*.044	.125	.369
Freshman Exp.					.068	**.004
Honors						**.001

Note: *Correlation is significant at the 0.05 level (1-tailed)
**Correlation is significant at the 0.01 level (1 tailed)

Six of the 36 correlations in Year Three were significant. Positive correlations were found between Freshman Year Experience and First Generation; Pell Eligible and Freshman Year Experience; and Pell Eligible with Female. Negative correlations were found between Female and White; Pell Eligible and White; and Honors and Pell Eligible. Table 7 displays these results.

Table
7. Correlations of Categorical Variables for Year Three

Measure	First Gen	Female	Math 098	Freshman Exp.	Pell Eligible	Honors
			Correlation			
White	.053	-.075	.021	-.045	-.356	-.015
First Gen		-.019	-.006	.059	.018	-.032
Female			-.013	-.046	.077	-.006
Math 098				.006	-.041	-.023
Freshman Exp.					.087	.039
Pell Eligible						-.100
			Sig. (1-tailed)			
White	.052	*.010	.263	.084	**.000	.321
First Gen		.280	.427	*.034	.286	.161
Female			.341	.077	**.008	.429
Math 098				.432	.103	.243
Freshman Exp.					**.004	.113
Pell Eligible						**.001

Note: *Correlation is significant at the 0.05 level (1-tailed)
**Correlation is significant at the 0.01 level (1 tailed)

Eight of the 36 correlations between categorical variables were significant for Year Four. Positive correlations were found between Freshman Year Experience and First Generation, Honors and Pell Eligible; and between Female and White and Math 098. Negative correlations were found between Pell Eligible and White and Honors and Female with Pell Eligible. Table 8 displays these results.

Table
8. Correlations of Categorical Variables for Year Four

Measure	First Gen	Math 098	Honors	Pell Eligible	Freshman Exp.	Female
			Correlation			
White	.054	.039	-.031	**-.349**	-.019	**.096**
First Gen		-.005	-.034	.024	**.065**	.020
Math 098			-.017	-.029	.032	**.060**
Honors				**-.103**	**.057**	-.003
Pell Eligible					**.080**	**-.097**
Freshman Exp.						.031
			Sig. (1-tailed)			
White	.059	.127	.186	**.000	.291	**.003
First Gen		.445	.159	.246	*.030	.278
Math 098			.309	.196	.174	*.041
Honors				**.001	*.048	.460
Pell Eligible					**.010	**.002
Freshman Exp						.186

Note: *Correlation is significant at the 0.05 level (1-tailed)
**Correlation is significant at the 0.01 level (1 tailed)

A correlation matrix was calculated and constructed for each of the years of enrollment studied. The outcomes of these matrices were also supportive of the independent variables being related while not displaying too strong of a correlation for inclusion in the regression models (Hosmer & Lemeshow, 2000). See Appendices I, J, K, and L for the details of these results.

Another test Pallant recommended to eliminate the threat of multicollinearity within logistic regression equations was a test for tolerance and variance among the predictors. Patton explained that, "tolerance is an indicator of how much of the variability of the specified independent is not explained by the other independent variables in the model" (Pallant, 2007, p. 156). It was calculated by applying the formula 1- R for each predictor. The variance inflation factor (VIF) was then calculated by (1 divided by the tolerance). To ensure protection from multicollinearity, Pallant recommended that the variance tolerance values not be less than .10 nor the VIF values be above 10. None of the variables met this criterion therefore; multicollinearity was not a factor. See Appendices M, N, O, and P for the results of these calculations (Pallant, 2007, p. 155).

The final phase of the preliminary analyses consisted of preparing the file for IBM SPSS Statistics 19.Since examining the impact of the variables for each year the students were enrolled would provide more useful information, the set was grouped by each year retained. The descriptions for the time periods corresponding with the year labels are shown in Table 9.

Table
9. Descriptions of Time Periods for Year Labels

Label	Description
Year One	Students entered Fall 2007 and were enrolled Fall 2008.
Year Two	Students were enrolled Fall 2008 and were enrolled Fall 2009
Year Three	Student were enrolled Fall 2009 and were enrolled Fall 2010
Year Four	Students were Enrolled Fall 2010 and were enrolled Spring 2011*

Note: * spring enrollment was the measure to determine retention for Year Four.

Enabling the dataset to be analyzed in separate groups for each time period allowed a more comprehensive study of the relationship between factors as students progressed in their academic paths (Goenner and Snaith, 204). After dismissing cases for missing data, the dataset contained 1,346 students.

Logistic Regression

Logistic regression was chosen as the best type of analysis to use to measure the relationships among factors consisting of both categorical and continuous variables having binary outcome (Wuensch, 2010). This form of statistical analysis allows the associations between scores to be displayed and the direction, form, and strength of the relationships between variables illustrated (Creswell, 2005).

Hosmer and Lemeshow (2000) provided the logistic regression calculation which is:

$$\pi(\chi) = \frac{\mathrm{e}^{\beta} o + b1x}{1 + \mathrm{e}^{\beta} o + b1x}$$

"The logistic regression model includes the logit transformation in terms of as $\pi(x)$. It is

$$g(x) = 1n\left[\frac{\Pi(x)}{1-\Pi(x)}\right]$$

$$= \beta_o + \beta_\iota \chi \quad .$$

The logit, $g(x)$ is linear in its variable values, may be continuous, and may range from $-\infty$ to $+\infty$ depending on the range of x (Hosmer & Lemeshow, 2000, p.6).

Logistic Regression allows a distribution of the outcome variable to be dichotomous. The value of the outcome variable given x as y=$y = \pi(x) + \varepsilon$. The outcome can have a value of either one or zero. In logistic regression, the likelihood function expresses the probability of the observed data as a function of the unknown parameters. The maximum likelihood estimators of the parameters are chosen to maximize this function (Hosmer & Lemeshow, 2000).

This study examined the relationship among multiple predictors and the impact of the relationships on predicting the outcome variable of remaining enrolled in the institution. Logistic regression models the logit-transformed probability as a linear relationship. The calculation lets y be the binary outcome variable indicating failure (leaving college)/success (remaining enrolled) with 0/1 and *p* being the probability of y to be 1, *p*=prob(y=1). Let x1, xk be a set of predictor variables. Then the logistic regression of y on x1 , xk estimates parameter values for b., bz, ….., B1, via maximum likelihood method of the equation:

$$\text{Logit(pp)} = \log(p/1\text{-}p))=B0+ B1*xk.$$

Translated into probability terms, this equation is:

P=exp(B0 + B1*x1 … +B,*xk)(1+exp(B0+B1*x1 + … + Bk*xk))

The Naperian Logarithms (Natural Logarithms) is the basis for the relationship between the odds ratios and the beta-weights which has a base of 2.71828 (Hosmer & Lemeshow, 2000).

Each logistic regression analysis was evaluated using the Hosmer-Lemeshow goodness-of-fit statistic and the Omnibus Tests of Model Coefficients. The Hosmer-Lemeshow goodness-of-fit statistic is computed as:

$$x^2HL = g\Sigma k = 1(O1k - E1k)2Ek(1 - \xi k)$$

With a *p* value of $\Pr(x^2 \geq x^2 2HL)$ where x^2 is the chi-square statistic distributed with degrees of freedom (g-2). Hosmer and Lemeshow described this test as providing a "single, easily interpretable value that can be used to assess fit" (Hosmer & Lemeshow, 2000, p.151). Pallant (2007) explained that a significance value less than .05 on the Hosmer Lemeshow Test was an indicator that the model was a poor fit (Pallant, 2007, p. 174).

A second method used to assess the logistic regression models was the Cox and Snell pseudo R^2 statistic. The Cox and Snell R Square and the Nagelkerke R Square explain the amount of variance in the dependent variable (retained) determined by the model (Patton, 2007).

It was calculated as:

$$R2cs = 1 - \left(\frac{\mathcal{L}u(B^{(0)}}{\mathcal{L}u(B)}\right)\frac{2}{\widehat{N}} = 1 - \exp\left\{-\frac{-21\mathfrak{s}\left(B^{(0)}\right)-(-21s(\hat{B})}{\widehat{N}}\right\}$$

The Nagelkerke's R Square was computed as:

$$R^2_{N=}\frac{R^2_{CS}}{1-\left\{\widehat{L_U}\left|(B^{(0)})\right.\right\}21\,\widehat{N}}$$

The Cox and Snell R Square and the Nagelkerke's R Square are referred to as "pseudo R-squared statistics" as reported by Hosmer and Lemeshow (2001). Each of the logistic regression models passed the goodness of fit tests recommended by Pallant (2007) and Hosmer and Lemeshow (2000). Chapter Four will present these results.

4. RESULTS

The purpose of this study was to determine the family background and demographics, academic preparation and performance, and institutional constructs that predict the probability of students remaining enrolled in a large, public, urban, very high research activity institution. A quantitative study using logistic regression was conducted to analyze the relationship among the variables and their ability to predict the likelihood of the outcome variable, retained (remaining enrolled). The site of this study was a large four-year, very high research activity, doctoral university located in an urban setting.

The research was conducted in four steps.

1. Data were checked for errors and prepared for analysis.

2. Preliminary tests were performed including descriptive statistics.

3. The number of predictors was streamlined.

3. Correlation assessments were conducted to check for multicollinearity.

4. Logistic regression was used to analyze the data.

The descriptive statistics, results of the logistic regression equations performed, and resulting crosstabs of descriptive statistics by the binary outcome for retention follow by year of enrollment.

Year One

Descriptive statistics

Descriptive statistics were computed for the predictors for Year One. Table 10 displays the mean, standard deviation, standard of error and range for the continuous variables and the number and percentage for the categorical variables.

Table
10. Descriptive Statistics for 1,346 Students beginning Year One

Continuous Variables	*M*	*SD*	*SE*	Min	Max
Academic Preparation and Performance					
ACT Composite	24.08	3.61	.10	16.00	35.00
Cumulative GPA	2.55	1.12	.03	.00	4.00
High School GPA	3.46	.66	.02	1.81	5.28
Family Background and Demographics					
Age	18.07	.77	.02	16.00	38.00
Unmet Need	-76.03	6757.10	184.18	-31102.95	22313.00
Institutional Constructs					
Advising Appointments	2.54	1.97	.05	.00	14.00
Early Alerts Issued	.71	1.01	.03	.00	6.00
Changed Major	.38	.56	.02	.00	3.00
Student Engagement	.00	.04	.00	.00	1.00
Supplemental Instruction	.00	.00	.00	.00	.00

Categorical Variables	*n*	%
Family Background and Demographics		
Pell Eligible	397.00	29.00
White	838.00	62.00
Female	789.00	59.00
First Generation	24.00	2.00
Institutional Constructs		
Freshman Year Experience	235.00	17.00
Honors Program	107.00	8.00
On Campus Housing	814.00	60.00

Note: Min.=Minimum in range, Max.=Maximum amount in range

Logistic Regression

The predictors included in the logistic regression for Year One were:

Academic Preparation and Performance-

- ACT Composite,

- Cumulative GPA, and
- High School GPA;

Family Background and Demographics-

- Ethnicity (White),
- Gender (Female),
- Pell Eligible, and
- Unmet Financial Need;

Institutional Constructs-

- Advising,
- Change of Major,
- Early Alerts,
- Freshman Year Experience, and
- On-Campus Housing.

The Beta, Standard Error, Wald, Degrees of Freedom, Significance, Odds Ratio (OR), Lower and Upper range for the logistic regression for Year One are displayed in Table 11.

Table
11. Logistic Regression Results for Year One

Predictor	*B*	*SE*	Wald x^2	*df*	Sig.	*OR*	Lower	Upper
Academic Preparation and Performance								
ACT Composite	.01	.03	.11	1	.74	1.01	.95	1.08
Cumulative GPA	1.38	.11	174.90	1	.00*	3.99	3.25	4.90
High School GPA	-.14	.18	.58	1	.45	.87	.62	1.24
Family Background & Demographics								
Ethnicity (White)	.83	.21	15.04	1	.00*	2.29	1.51	3.47
Gender (Female)	.18	.19	.97	1	.33	1.20	.83	1.71
Pell Eligible	-.23	.24	.90	1	.34	.80	.50	1.27
Unmet Need	.00	.00	.93	1	.34	1.00	1.00	1.00
Institutional Constructs								
Advising	.19	.05	13.80	1	.00*	1.21	1.09	1.34
Change of Major	1.35	.22	38.66	1	.00*	3.86	2.52	5.90
Early Alerts	-.07	.08	.61	1	.43	.94	.80	1.10
Freshman Year Experience	-.31	.26	1.44	1	.23	.74	.44	1.22
On-Campus Housing	.38	.19	3.83	1	.05*	1.46	1.00	2.14
Constant	-2.38	.87	7.47	1	.01	.09		

Note: B= beta weight, *SE*= Standard error, Min.=Minimum amount in range, Max.=Maximum amount in range, df= degrees of freedom; Sig.= Significance; OR= Odds Ratio
Confidence interval 95% , *p<.05

The model for Year One met the Hosmer-Lemeshow goodness of fit test with a Chi-square of 8.32 and eight degrees of freedom. The model explained between 31% and 48% of the variance in the log odds for students remaining enrolled. The -2 Log likelihood of 879.854 was significant. The Omnibus Test of Model Coefficient Chi-square was 491.272 with 10 degrees of freedom. The model correctly predicted the retention status of 79.3% of the students and had a statistical significance of .000 ($p <$ .05) (Hosmer &Lemeshow, 2000).

Based on the logistic regression results for Year One, the null hypothesis that Academic Preparation and Performance factors do not predict the likelihood of continued enrollment was rejected as Cumulative GPA was a statistically significant contributor to the model. For each unit increase of one in cumulative GPA (on a four point scale) students were nearly four times more likely to return.

The null hypothesis that Family Background and Demographics do not predict retention in Year One was rejected as Ethnicity was a statistically significant contributor to the model. Students who were White were more than twice as likely to return for Fall.

The null hypothesis that Institutional Constructs were not predictors of retention was rejected as Advising, Change of Major, and On-Campus Housing were statistically significant contributors to the model for Year One. For each advising session attended the likelihood of students returning in the Fall increased by a factor of 1.2. Students living in On-Campus Housing were almost 1.5 times more likely to be retained. Last, for each Change of Major, a student increased the likelihood of returning by a factor of 3.86.

Crosstabs

Crosstabs were computed to provide the distribution statistics for the predictor variables. Table 12 presents the predictors, mean, standard deviation, range (minimum, maximum), number, and percent by retained and not retained for year one of enrollment.

Table

12. Descriptive Statistics for Year One Retention Status

Continuous	Not Retained (N=278/ 21%)				Retained (N=1068/ 79%)			
Variables	*M*	*SD*	Min	Max	*M*	*SD*	Min	Max
Academic Preparation and Performance								
A	23.25	3.12	17.00	32.00	24.30	3.70	16.00	35.00
B	1.31	1.23	.00	4.00	2.87	.82	.00	4.00
C	3.13	.68	1.82	4.58	3.54	.63	1.81	5.28
Family Background and Demographics								
D	18.13	.71	17.00	26.00	18.05	.78	16.00	38.00
E	1702.00	5381.00	-31103.00	17352.00	-539.00	7000.00	-30968	22313.00
Institutional Constructs								
F	.15	.37	.00	2.00	.44	.59	.00	3.00
G	1.85	1.94	.00	11.00	2.72	1.94	.00	14.00
H	1.13	1.28	.00	6.00	.60	.90	.00	6.00
I	.00	.00	.00	.00	.00	.04	.00	1.00
J	.00	.00	.00	.00	.00	0.00	.00	.00
Categorical Variables		*n*		%		*n*		%
Family Background and Demographics								
K		87.00		31.00		310.00		29.00
L		196.00		71.00		642.00		60.00
M		155.00		56.00		634.00		59.00
N		15.00		5.00		9.00		1.00
Institutional Constructs								
O		36.00		13.00		199.00		19.00
P		1.00		0.00		106.00		10.00
Q		141.00		51.00		673.00		63.00

Note: A-ACT Composite, B- Cumulative GPA, C- High School GPA, D- Age, E- Unmet Need, F- Changed Major, G- Advising, H- Early Alerts Issued, I- Student Engagement, J- Supplemental, K -Pell Eligible, L- Ethnicity (White), M- Female, N -First Generation, O- Freshman Year, P- Honors Program, Q- Campus Housing, Min.= minimum value in range, Max.= maximum value in range

Of the 1,346 students entering in Fall 2007, 80% returned for Fall 2008 while 20% did not return.

Year Two

Descriptive Statistics

Descriptive statistics were computed for the predictors for Year Two. Table 13 displays the mean, standard deviation, standard of error and range for the continuous variables and the number and percentage for the categorical variables.

Table
13. Descriptive Statistics for 1,068 Students beginning Year Two

Continuous Variables	*M*	*SD*	*SE*	Min	Max
Academic Preparation and Performance					
ACT Composite	24.29	3.69	.11	16.00	35.00
Cumulative GPA	2.70	1.00	.03	.00	4.00
High School GPA	3.54	.63	.02	1.81	5.28
Family Background and Demographics					
Age	18.06	.78	.02	16.00	38.00
Unmet Need	-401.94	7098.71	215.31	-31695.44	22338.00
Institutional Constructs					
Advising Appointments	6.10	3.34	.10	.00	23.00
Early Alerts Issued	1.80	1.93	.06	.00	11.00
Changed Major	.87	1.18	.04	.00	6.00
On Campus Housing	1.05	.88	.03	.00	2.00
Student Engagement	.04	.21	.00	.00	2.00
Supplemental Instruction	3.94	9.64	.29	.00	83.00

Categorical Variables	*n*	%
Family Background and Demographics		
Pell Eligible	315	29.00
Ethnicity (White)	655	60.00
Female	644	59.00
First Generation	13	1.00
Institutional Constructs		
Freshman Year Experience	201	18.00
Honors Program	107	10.00

Note: Min.=Minimum in range, Max.=Maximum amount in range

Logistic Regression

For Year Two, the following predictors were included in the logistic regression model:

Academic Preparation and Performance-

- ACT Composite,
- Cumulative GPA, and
- High School GPA;

Family Background and Demographics-

- Ethnicity (White),
- Gender (Female),
- Pell Eligible, and
- Unmet Financial Need; and

Institutional Constructs-

- Advising,
- Change of Major,
- Early Alerts,
- Freshman Year Experience,
- Honors Program,
- On-Campus Housing, and
- Supplemental Instruction.

Table 14 displays the Beta, Standard Error, Wald, Degrees of Freedom, Significance, Odds Ratio, Lower and Upper range of the logistic regression for Year Two.

Table
14. Logistic Regression Results for Year Two

Predictor	*B*	*SE*	Wald x^2	*df*	Sig.	OR	Min	Max
Academic Preparation and Performance								
ACT Composite	.02	.04	.32	1	.57	1.02	.94	1.11
Cumulative GPA*	1.20	.11	118.39	1	.00*	3.31	2.67	4.10
High School GPA	-.05	.21	.06	1	.82	.95	.63	1.44
Family Background and Demographics								
White	.55	.26	4.42	1	.04*	1.74	1.04	2.90
Female	.18	.23	.64	1	.42	1.20	.77	1.86
Pell Eligible	.18	.28	.41	1	.52	1.19	.69	2.06
Unmet Need	.00	.00	2.31	1	.13	1.00	1.00	1.00
Institutional Constructs								
Advising	.07	.04	3.52	1	.06	1.07	.10	1.15
Change of Major	.04	.09	.17	1	.68	1.04	.87	1.25
Early Alerts	-.03	.06	.19	1	.66	.97	.87	1.10
Freshman Year Experience*	-.99	.33	8.94	1	.00*	.37	.19	.71
Honors Program	-.25	.56	.21	1	.65	.78	.26	2.31
On-Campus Housing	-.09	.14	.47	1	.49	.91	.70	1.20
Supplemental Instruction	.02	.02	.97	1	.32	1.02	.98	1.07
Constant	-1.00	1.29	.60	1	.44	.37		

Note: B= beta weight, *SE*= Standard error, Min.=Minimum amount in range, Max.=Maximum amount in range, *df*= degrees of freedom; Sig.= Significance; OR= Odds Ratio
Confidence interval 95% , *p<.05

The model for Year Two met the Hosmer-Lemeshow goodness of fit test with a Chi-square of 14.240, eight degrees of freedom and a significance of .076 (where $p > .05$). The model explained between 20% and 36% of the variance in the log odds for students remaining enrolled with a -2 Log likelihood of 629.06. The Omnibus Test of Model Coefficient had a Chi-square of 243.379 and 14 degrees of freedom. The model was statistically significant at .000 (where $p < .005$) (Hosmer &Lemeshow, 2000).

The logistic regression results for Year Two reject the null hypothesis that Academic Preparation and Performance factors do not predict the likelihood of retention

as Cumulative GPA was a statistically significant contributor to the model. Students saw an increase of the likelihood of being retained by a factor of 3.3 per one unit increase in Cumulative GPA.

The null hypothesis that no Family Background and Demographics variables predict retention in Year Three was rejected as Ethnicity was a statistically significant contributor to the model. Students who were White were 1.74 times more likely to be retained.

The null hypothesis that no Institutional Construct variables predict retention was rejected for Year Four as Freshman Year Experience was a statistically significant contributor to the model. Students completing a Freshman Year Experience course were .37 times less likely to be retained.

Crosstabs

Crosstabs were computed to provide the distribution statistics for the predictor variables. The predictors, mean, standard deviation, range (minimum, maximum), number, and percent by retained and not retained for year two of enrollment are provided in Table 15.

Table
15. Descriptive Statistics for Year Two by Retention Status

Continuous	Not Retained (N=150/14%)				Retained (N=937/ 86%)			
Variable	*M*	*SD*	Min	Max	*M*	*SD*	Min	Max
Academic Preparation and Performance								
A	23.33	3.18	16.00	32.00	24.44	3.74	17.00	35.00
B	1.47	1.27	.00	3.90	2.90	.80	.00	4.00
C	3.29	.58	2.02	4.46	3.58	.62	1.81	5.28
Family Background and Demographics								
D	18.08	.73	17.00	23.00	18.05	.79	16.00	38.00
E	467.59	6124.17	-27046.00	18425.00	-541.13	7235.77	-31695.44	22338.00
Institutional Constructs								
F	4.90	3.22	.00	15.00	6.29	3.33	.00	23.00
G	2.52	2.03	.00	10.00	1.69	1.89	.00	11.00
H	.72	1.12	.00	4.00	.89	1.18	.00	6.00
I	.79	.81	.00	2.00	1.10	.88	.00	2.00
J	.01	.08	.00	1.00	.05	.23	.00	2.00
K	1.06	3.56	.00	33.00	4.40	10.21	.00	83.00
Categorical Variable		*n*		%		*n*		%
Family Background and Demographics								
L		102.00		16.00		553.00		84.00
M		47.00		15.00		268.00		85.00
N		80.00		12.00		564.00		88.00
O		8.00		62.00		5.00		38.00
Institutional Constructs								
P		18.00		9.00		183.00		91.00
Q		5.00		5.00		102.00		95.00

Note: A- ACT Composite, B- Cumulative GPA, C- High School GPA, D- Age, E- Unmet Need, F- Advising Appointments, G- Early Alerts Issued, H- Changed Major, I- On-Campus Housing, J- Student Engagement, K- Supplemental Instruction, L- Ethnicity (White), M- Pell Eligible, N- Female, O- First Generation, P- Freshman Year Experience, Q- Honors Program, Min.= minimum value in range, Max.= maximum value in range

Year Three

Descriptive Statistics

Descriptive statistics were constructed for the predictors measured in Year Three. Table 16 displays the mean, standard deviation, standard of error and range for the continuous variables and the number and percentage for the categorical variables.

Table
16. Descriptive Statistics for 937 Students beginning Year Three

Continuous Variable	*M*	*SD*	Min	Max
Academic Preparation and Performance				
ACT Composite	24.00	3.75	17.00	35.00
Cumulative GPA	2.78	1.00	.00	4.00
High School GPA	3.58	.62	1.81	5.28
Family Background and Demographics				
Age	18.06	.79	16.00	38.00
Unmet Need	-620.14	7251.95	-30559.21	24421.00
Institutional Constructs				
Advising Appointments	9.16	4.52	.00	32.00
Early Alerts Issued	2.60	2.67	.00	15.00
Changed Major	1.29	1.27	.00	6.00
On Campus Housing	1.37	1.20	.00	3.00
Student Engagement	.19	.57	.00	5.00
Supplemental Instruction	6.03	13.65	.00	110.00

Categorical Variable	*n*	%
Family Background and Demographics		
Pell Eligible	271.00	28.00
Ethnicity (White)	565.00	59.00
Female	571.00	60.00
First Generation	8.00	1.00
Institutional Constructs		
Freshman Year Experience	184.00	19.00
Honors Program	103.00	11.00

Note: Min.=Minimum in range, Max.=Maximum amount in range

Logistic Regression

The Predictors included in the logistic regression model for Year Three were as follows:

Academic Preparation and Performance-

- ACT Composite,
- Cumulative GPA, and
- High School GPA;

Family Background and Demographics-

- Ethnicity (White),
- Gender (Female),
- Pell Eligible, and
- Unmet Financial Need;

Institutional Constructs-

- Advising,
- Change of Major,
- Early Alerts,
- Engagement Courses,
- Freshman Year Experience,
- Honors Program,
- On-Campus Housing, and
- Supplemental Instruction.

The Beta, Standard Error, Wald, Degrees of Freedom, Significance, Odds Ratio, Lower and Upper Range of the logistic regression are displayed in Table 17.

Table
17. Logistic Regression Results for Year Three

Predictors	B	S.E.	Wald x^2	*df*	Sig.	OR	Min	Max
Academic Preparation and Performance								
ACT Composite	-.09	.05	3.32	1	.07	.91	.82	1.01
Cumulative GPA*	1.26	.12	119.00	1	.00*	3.52	2.81	4.42
High School GPA	.13	.25	.26	1	.61	1.13	.70	1.84
Family Background and Demographics								
White	.03	.30	.01	1	.92	1.03	.58	1.84
Female	.37	.26	2.02	1	.16	1.45	.87	2.43
Pell Eligible	.09	.31	.10	1	.76	1.10	.60	2.00
Unmet Need	.00	.00	2.48	1	.12	1.00	1.00	1.00
Institutional Constructs								
Advising	.01	.03	.10	1	.76	1.01	.96	1.06
Change of Major	.19	.10	3.62	1	.06	1.22	.99	1.48
Early Alerts	-.06	.05	1.40	1	.24	.94	.86	1.04
Engagement Courses	.445	.40	1.16	1	.28	1.55	.70	3.41
Freshman Year Experience	.28	.31	.77	1	.38	1.32	.71	2.44
Honors Program	.45	.49	.83	1	.36	1.56	.60	4.10
On-Campus Housing	-.05	.12	.17	1	.68	.95	.75	1.21
Supplemental Instruction	.02	.02	1.34	1	.25	1.02	.99	1.05
Constant	-.13	1.48	.01	1	.93	.88		

Note: B= beta weight, Min.=Minimum in range, Max.=Maximum amount in range SE=Standard Error; df= degrees of freedom; Sig.= Significance; OR= Odds Ratio
*Confidence interval 95% , *p<.05*

The model for Year Three met the Hosmer-Lemeshow goodness of fit test with a Chi-square of 7.498 with 8 degrees of freedom and a significance of .484 (p >.05). The results indicated the model explained between 23% and 43% of the variance in the log odds for students remaining enrolled with a -2 Log likelihood of 470.70. The Omnibus Test of Model Coefficient Chi-square was 242.50 with 15 degrees of freedom. The model had a significance of .000 (p<.05). The logistic regression correctly predicted 91.3% of the retention status for students (Hosmer & Lemeshow, 2000).

The results of the logistic regression model for Year Three accepted the null hypothesis that Family Background and Demographics do not predict retention as none of the predictors were statistically significant contributors to the model.

The results of the logistic regression model for Year Three rejected the null hypothesis that Academic Preparation and Performance do not predict retention as Cumulative GPA was significant. For each one point increase in Cumulative GPA students were more likely to be retained by a factor of 3.5.

The results of the logistic regression for Institutional Constructs in Year Three accepted the null hypothesis that institutional constructs do not predict retention as none of the Predictors were statistically significant contributors to the model.

Crosstabs

Crosstabs were computed to provide the distribution statistics for the predictor variables. The predictors, mean, standard deviation, range (minimum, maximum), number, and percent by retained and not retained for year three of enrollment. are provided in Table 18.

Table
18. Descriptive Statistics for Year Three by Retention Status

Continuous	Not Retained (*N*=118/ 12.4%)					Retained (*N*=833/ 87.6%)			
Variable	*M*	*SE*	*SD*	Min	Max	*M*	*SD*	Min	Max
Academic Preparation and Performance									
A	23.37	.32	3.44	19.00	33	24.58	.13	3.77	17.00	35.00
B	1.31	.12	1.32	.00	3.78	2.98	.03	.74	.00	4.00
C	3.28	.06	.62	2.02	4.64	3.62	.02	.61	1.81	5.28
Family Background and Demographics									
D	18.00	.04	.40	16.00	19.00	18.06	.03	.83	16.00	38.00
E	1.03	.11	1.24	.00	6.00	1.33	.04	1.27	.00	6.00
F	2217.00	595.00	6458.00	-23550.00	19243.00	-1022.00	252.00	7272.00	-30560.00	24421.00
Institutional Constructs									
G	9.12	.47	5.13	.00	32.00	9.17	.15	4.43	.00	30.00
H	4.44	.28	3.01	.00	15.00	2.34	.09	2.51	.00	12.00
I	1.16	.11	1.14	.00	3.00	1.4	.04	1.21	.00	3.00
J	.07	.03	.29	.00	2.00	.21	.02	.59	.00	5.00
K	2.07	.51	5.58	.00	38.00	6.59	.50	14.34	.00	110.00

Categorical Variable	*n*	%	*n*	%
Family Background and Demographics				
L	48.00	18.00	223.00	82.00
M	63.00	11.00	502.00	89.00
N	71.00	12.00	500.00	88.00
O	1.00	13.00	7.00	88.00
Institutional Constructs				
P	10.00	10.00	93.00	90.00
Q	29.00	16.00	155.00	84.00

Note. A- ACT Composite, B-Cumulative GPA, C-High School GPA, D-Age, E-Change of Major, F-Unmet Need, G-Early Alerts, H-On-Campus Housing, I-Supplemental Instruction, J-Pell Eligible, K-White, L-Pell Eligible, M-White, N-Female, O-First Generation, P-Honors Program, Q-Freshman Year Experience, Min.= minimum value in range, Max.= maximum value in range

Year Four

Descriptive Statistics

Descriptive statistics, mean, standard deviation, range, number and percent, were constructed for the predictors for Year Four. Table 19 displays the mean, standard deviation, standard of error and range for the continuous variables and the number and percentage for the categorical variables.

Table
19. Descriptive Statistics for 833 Students beginning Year Four

Continuous Variable	*M*	*SD*	Min	Max
Family Background and Demographics				
Age	18.07	.77	16.00	38.00
Unmet Need	-76.03	6757.10	-31102.95	22313.00
Academic Preparation and Performance				
ACT Composite	24.08	3.61	16.00	35.00
Cumulative GPA Spring 2008	2.55	1.12	.00	4.00
High School GPA	3.46	.66	1.81	5.28
Institutional Constructs				
Advising Appointments	2.54	1.97	.00	14.00
Early Alerts Issued	.71	1.01	.00	6.00
Changed Major	.38	.56	.00	3.00
Student Engagement	.48	.91	.00	6.00
Supplemental Instruction	6.98	14.95	.00	110.00
Categorical Variable		*n*	%	
Family Background and Demographics				
Pell Eligible		227.00	27.00	
Ethnicity (White)		516.00	61.00	
Female		512.00	60.00	
First Generation		8.00	1.00	
Institutional Constructs				
Freshman Year Experience		159.00	19.00	
Honors Program		94.00	11.00	

Note: Min.=Minimum in range, Max.=Maximum amount in range

Logistic Regression

The predictors included in the model for Year Four were as follows:

Academic Preparation and Performance-

- ACT Composite,
- Cumulative GPA, and
- High School GPA;

Family Background and Demographics-

- Ethnicity (White),
- Gender (Female),
- Pell Eligible, and
- Unmet Financial Need;

Institutional Constructs-

- Advising,
- Change of Major,
- Early Alerts,
- Engagement Courses,
- Freshman Year Experience,
- Honors Program,
- On-Campus Housing, and
- Supplemental Instruction.

Table 20 displays the results of the logistic regression model

Table
20. Logistic Regression Results for Year Four

Predictor	*B*	*SE*	Wald x^2	*df*	Sig.	OR	Min.	Max.
Academic Preparation and Performance								
ACT Composite	-.26	.11	5.51	1	.02*	.77	.62	.96
High School GPA	1.06	.61	3.01	1	.08	2.89	.87	9.57
Cumulative GPA	2.45	.30	68.94	1	.00*	11.58	6.49	20.64
Family Background and Demographics								
Ethnicity (White)	-.65	.64	1.05	1	.31	.52	.15	1.81
Gender (Female)	.03	.53	.00	1	.95	1.03	.36	2.93
Pell Eligible	.04	.71	.00	1	.96	1.04	.26	4.15
Unmet Need	.00	.00	1.64	1	.20	1.00	1.00	1.00
Institutional Constructs								
Advising	-.04	.05	.90	1	.34	.96	.88	1.05
Change of Major	-.48	.22	4.60	1	.03*	.62	.40	.96
Early Alerts	-.08	.09	.86	1	.36	.92	.77	1.10
Engagement Courses	-.88	.40	4.85	1	.03*	.41	.19	.91
Freshman Year Experience	.19	.65	.08	1	.77	1.21	.34	4.35
Honors Program	1.64	1.05	2.45	1	.12	5.15	.66	40.10
On-Campus Housing	.11	.24	.23	1	.63	1.12	.70	1.79
Supplemental Instruction	.12	.05	6.46	1	.01*	1.13	1.03	1.24
Constant	1.61	2.91	.31	1	.58	5.02		

Note: B= beta weight, Min.=Minimum amount in range, Max.=Maximum amount in range, df= degrees of freedom; Sig.= Significance; OR= Odds Ratio
*Confidence interval 95% , *p<.05*

The model for Year Four met the Hosmer-Lemeshow goodness of fit test with a Chi-square of 13.079 with 8 degrees of freedom and a significance of .109 (p >.05). The results indicated the model explained between 27% and 74% of the variance in the log odds for students' retention rate with a -2 Log likelihood of 117.509. The Omnibus Test of Model Coefficient Chi-square was 268.460 with 15 degrees of freedom. The model had a significance of .000 (p=<.05) (Hosmer &Lemeshow, 2000).

The null hypothesis that Academic Preparation and Performance variables were not predictors of retention was rejected as ACT Composite and Cumulative GPA were statistically significant contributors to the model. Students having an ACT Composite score increase of one unit were less likely to be retained by a factor of .768. Students

having an increase in Cumulative GPA were more likely to be retained by a factor of 11.57 for each one point increase in grade point average.

The null hypothesis that Family Background and Demographics were not predictors of retention was accepted as none of the variables were statistically significant contributors to the model.

The null hypothesis that Institutional Constructs were not predictors of retention was rejected as Engagement Courses, Change of Major, and Supplemental Instruction were statistically significant contributors to the model. Students enrolling in courses with Engagement components were .41 times less likely to remain enrolled. In Year Four, for each change in major students were .62 times less likely to be retained. Students who participated in Supplemental Instruction were 1.13 times more likely to remain enrolled for each additional session in which they participated.

Crosstabs

Crosstabs were computed to provide the distribution statistics for the predictor variables. The predictors, mean, standard deviation, range (minimum, maximum), number, and percent by retained and not retained for year four of enrollment. in Table 21.

Table
21. Descriptive Statistics for Year Four by Retention Status

	Not Retained (N=51/ 6%)				Retained (N=800/ 94%)			
	M	*SD*	Min	Max	*M*	*SD*	Min	Max
Continuous Variable								
Academic Preparation and Performance								
A	18.00	.71	17.00	26.00	18.05	.78	16.00	38.00
B	1,702.00	5,381.00	-31,103.00	17,352.00	-539.00	7,000.00	-30,968.00	22,313.00
Family Background and Demographics								
C	23.00	3.12	17.00	32.00	24.30	3.70	16.00	35.00
D	1.31	1.23	.00	4.00	2.87	.82	.00	4.00
E	3.13	.68	1.82	4.58	3.54	.63	1.81	5.28
Institutional Constructs								
F	1.85	1.94	.00	11.00	2.72	1.94	.00	14.00
G	1.13	1.28	.00	6.00	.60	.90	.00	6.00
H	.15	.37	.00	2.00	.44	.59	.00	3.00
I	.22	.81	.00	4.00	.50	.92	.00	6.00
J	1.40	5.40	.00	38.00	7.34	15.29	.00	110.00
Categorical Variable			*n*	%			*n*	%
Family Background and Demographics								
K			21.00	9.00			206.00	91.00
L			28.00	5.00			488.00	95.00
M			27.00	5.00			485.00	95.00
N			1.00	12.00			7.00	88.00
Institutional Constructs								
O			11.00	7.00			148.00	93.00
P			7.00	7.00			87.00	93.00

Note: A- Age, B- Need C- ACT, D- GPA, E- HS GPAF- Advising, G- Alerts, H- Major, I- Engagement Courses, J- Supplemental Instruction, K- Pell Eligible, L- White, M- Female, N- First Generation, 5. Institutional Constructs, O- FYE, P- Honors, Min.= minimum value in range, Max.= maximum value in range

By the Spring term of Year Four, 6% of the students who had returned Fall term did not remain enrolled while 94% of the 851 students persisted.

Summary

A summary of the null hypotheses and the results of the logistic regressions are displayed in Table 22.

Table
22 Null Hypotheses and Results

Null Hypothesis	Year One	Year Two	Year Three	Year Four
Academic Preparation and Performance variables do not predict retention.	rejected	rejected	rejected	rejected
Family Background and Demographic variables do not predict retention.	rejected	accepted	accepted	accepted
Institutional Construct variables do not predict retention.	rejected	rejected	rejected	rejected

Of the three null hypotheses applied to the results for each year, only Family Background and Demographics was accepted. It was accepted for Year Two, Year Three, and Year Four.

Summary of Logistic Regression Results

Table 23 displays the results of each of the logistic regression models by year and Beta, Significance, and Odds Ratio.

Table
23 Summary of Logistic Regression Results for Year One, Two, Three and Four

	Year One			Year Two			Year Three			Year Four		
Predictors	*B*	Sig	OR	*B*	Sig.	OR	*B*	Sig.	OR	*B*	Sig.	OR
Academic Preparation and Performance												
ACT Composite	.01	.74	1.01	.02	.57	1.02	-.09	.07	.91	-.30	*.02	.80
Cum GPA	1.38	*.00	3.99	1.20	*.00	3.31	1.26	*.00	3.52	2.50	*.00	11.60
High School GPA	-.14	.45	.87	-.10	.82	.95	.13	.61	1.13	1.10	.08	2.90
Family Background and Demographics												
White	.83	*.00	2.29	.55	*.04	1.74	.03	.92	1.03	-.65	.31	.52
Female	.18	.33	1.20	.18	.42	1.20	.37	.16	1.50	.03	.95	1.03
Pell Eligible	-.23	.34	.80	.18	.52	1.19	.09	.76	1.10	.04	1.00	1.04
Unmet Need	.00	.34	1.00	.00	.13	1.00	.00	.12	1.00	.00	.20	1.00
Institutional Constructs												
Advising	.19	*.00	1.21	.07	.06	1.07	.010	.76	1.01	-.04	.34	.96
Early Alert	-.07	.43	.94	-.03	.66	.97	-.06	.24	.94	-.08	.36	.92
Engagement	-	-	-	-	-	-	.44	.28	1.55	-.90	*.03	.41
FYE	-.31	.23	.74	-.99	*.00	.37	.28	.38	1.34	.20	.77	1.20
Honors	-	-	-	-.26	.65	.78	.45	.36	1.56	1.60	.12	5.20
Major	1.35	*.00	3.86	.04	.68	1.04	.19	.06	1.22	-.50	*.03	.62
Housing	.38	*.05	1.46	-.09	.49	.91	-.05	.68	.95	.10	.63	1.10
Sup. Instruction	-	-	-	.02	.32	1.02	.02	.25	1.02	.10	*.01	1.10
Constant	-2.38	.87	.09	-1.00	.44	.37	-.13	.93	.88	1.60	.58	5.00

Note: Min.=Minimum in range, *Max.*=Maximum amount in range *SE*=Standard Error; df= degrees of freedom; Sig.= Significance; OR= Odds Ratio, Sup. Instruction= Supplemental Instruction
: N= 937; Confidence interval 95% , *p<.05

Summary of Institutional Approaches

The results of the binary logistic regression equations found six variables in the category for institutional constructs, (Advising, Engagement, On-Campus Housing, Change of Major, Supplemental Instruction, and Freshman Year Experience courses), to be predictive of retention. Advising and Campus Housing were significant in the first year. Engagement was significant in Year Four. Change of Major was significant in Year

One and Year Four. Supplemental Instruction was significant in Year Four. Participation in Freshman Year Experience courses was significant in Year Two.

Family Background and Demographics

The binary logistic regression analyses found Ethnicity to be the only demographic variable to predict retention. The variable was significant for Year One and Year Two. Gender, Unmet Financial Need, and Pell Eligibility were not found to be statistically significant contributors to the models.

Academic Preparation and Performance

Results of the logistic regression analyses found two variables for Academic Preparation and Performance measures, ACT Composite score and Cumulative GPA, to predict retention. The ACT Composite score significantly contributed to the logistic regression for Year Four. The Cumulative GPA was statistically significant for each of the years, one through four. High School GPA was not statistically significant in any of the years examined.

Institutional Constructs

Eight variables, Advising, Early Alerts, Engagement Courses, Honors Programs, On-Campus Housing, Change of Major, Supplemental Instruction, and Freshman Year Experience courses, were chosen to examine the predictive power of Institutional Constructs. Of these eight variables, only Advising and On-Campus Housing were significant in Year One.

Predictors by Year of Enrollment

Year One

In Year One, students who visited their advisors were 1.2 times more likely to return for Fall. Students who changed their major were almost four times more likely to return for the second year. For each increase of one point in the cumulative GPA, students were nearly four times as likely to return. Students who were White were twice as likely to persist and students living in Campus Housing were 1.46 times more likely to persist.

Year Two

In Year Two, students were 3.3 times more likely to return with each one point increase in cumulative GPA. Students who were White were 1.73 times more likely to return. Last, students who took a Freshman Year Experience course were .37 times less likely to persist.

Year Three

During Year Three, Cumulative GPA was the only statistically significant predictor for retention. Students who experienced a one point increase in their cumulative GPA were nearly 12 times more likely to return the next fall.

Year Four

In Year Four, five of the variables were statistically significant. Each Change in Major made the odds of students returning for Spring decrease by a factor of 1.6.

Students having an increase by one point in cumulative GPA were 11.58 times more likely to return. Each Engagement course students took made the odds of returning in Spring decrease by a factor of 2.43. Finally, each Supplemental Instruction session in which a student participated increased the likelihood of their returning by a factor of 1.13.

Connections to the literature and recommendations will be discussed in chapter five, findings, implications, and recommendations.

5. FINDINGS, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

This study sought to identify the Academic Preparation and Performance variables, Family Background and Demographic variables, and Institutional Constructs that predicted retention for first-time full-time freshmen over a period of four academic years. The site of the study was a large, public, urban, very high research activity institution. The population selected was all first-time full-time freshmen entering the institution in the Fall term of 2007 without having any prior attendance at a four-year or two-year post secondary institution. Student data were collected and analyzed for the population of 1,346 students for each semester beginning Fall 2007 through Spring 2011. Logistic regression was utilized to study the interactions between the variables which included ACT Composite, Cumulative GPA, high school GPA, ethnicity, gender, age, unmet financial need, advising appointments, early alerts, engagement courses, changed majors, and their effect on the binary outcome of persistence.

The research questions posed included:

1. Does the academic preparation and performance of students predict retention?

2. Do student characteristics and family background predict retention?

3. Does participation in institutional approaches to retention predict retention?

Creswell (2003) recommended including hypotheses when they build on the research questions or follow the tradition in the literature. Because a number of the

articles reviewed utilized prediction models, null hypotheses indicating the direction of the prediction models were written (Creswell, 2003, p. 109). These were:

1. Academic Preparation and Performance variables do not predict retention;
2. Demographics and Family Background variables do predict retention; and
3. Institutional Construct variables do not predict retention.

Findings and Implications

Fifteen variables were chosen for analysis. Logistic regression was utilized to examine the relationships among the independent variables and their ability to predict the outcome of retention. Of the fifteen variables examined, nine made significant contributions to one or more of the four logistic regression equations. These variables were ACT composite, cumulative GPA, ethnicity, advising, engagement courses, freshman year experience courses, change of major, campus housing, and supplemental instruction.

Comparisons to Other Institutions

Before progressing to the examination of the results of the analyses and comparisons to other researchers' findings, it is important to note the implications of the institution's inability to easily define a peer institution with which to compare. As mentioned earlier in Chapter Three, the Carnegie Foundation allows institutions to perform queries in the Foundation's collected data as a means by which to locate similar institutions. The college in this study had no peers when all the classification areas were chosen. To demonstrate the significance of this a more in-depth evaluation of the classification system was performed (Carnegie Foundation, 2012).

The Carnegie Foundation maintains data on 4,633 institutions. Of the Carnegie schools, 2,713 were four-year schools. There were 294 Research Universities with 108 having very high research activity. Those figures place the school in a category comprising only 2.3% of all the institutions. There were 3,601 colleges offering undergraduate programs. There were three categories of offerings, a) Associate degrees only, b) Associate degrees dominant, and c) Baccalaureate degrees dominant. Forty-six percent of the schools offering undergraduate programs were Baccalaureate Dominant. Within this category, there were five subcategories, a) Arts & Sciences Focus, b) Arts & Sciences + Professions, c) Balanced Arts & Sciences/Professions d) Professions + Arts & Sciences and e) Professions Focus. The study institution's classification was Balanced Arts & Sciences/Professions with a High Coexistence with graduate programs. This placed the school among only 3% of all schools offering undergraduate programs. The profile noted that the program was five percentage points of the next category for Professions + Arts & Sciences (Carnegie Foundation, 2012).

The size and setting of the institution was Large (10,000+ students) and Primarily Nonresidential. This category contained 4% of undergraduate institutions. The results of the query noted that the number of students in residence was only five points from being placed in the next category for Primarily Residential (Carnegie Foundation, 2012).

The undergraduate profile was Medium Full-time Four-year, Selective, Higher Transfer-in. The explanation of this profile was that between 25% and 49% of the student population were undergraduates. To determine the level of selectivity of the admission criteria for the institution, Carnegie utilized college entrance scores reported to IPEDS and College Board for first-time full-time freshmen. Using the top score of the bottom

25% of the distribution of scores (25th percentile), the admission criteria were labeled as selective. Selective was the middle rank between inclusive and more selective. More than 20% of the undergraduate population consisted of transfer students. Of all the institutions with undergraduate programs 3% had this undergraduate profile (Carnegie Foundation, "Classification Descriptions", n.d.).

Finally, the school was among 3% of all graduate institutions who were STEM Dominant. The STEM classification indicated that science, technology, engineering, and mathematics programs were emphasized (Carnegie Foundation, 2012).

The number of areas where data show that the institution was on the outer-range and close to being in another category is important. Kuh (2008) stated that to adequately offer the programmatic measures to support students through to degree completion, "a school must first understand who its students are, what they are prepared to do academically, and what they expect of the institution and themselves" (p. 555). The institution may benefit from a reexamination of its mission (Kuh, 2008).

Academic Preparation and Performance

To measure academic preparation and performance the following variables were considered: High School GPA, ACT Composite and Cumulative GPA. Two of the three were significant. The strongest predictor of retention across the four years of collected information was Cumulative GPA. An increase of one point in Cumulative GPA made students 3.99 times more likely to return following Year One; 3.3 times more likely to return in Year Two; 3.5 times more likely to return in Year Three and 11.58 times more likely to return in Year Four. This finding is commensurate with other retention studies discussed in the literature review. Ryan and Glenn (2003) targeted students on academic

probation. By introducing a summer bridge program and teaching study skills, students' retention rates increased. However, counter to Ryan and Glenn's findings, this study did not observe High School GPA as a significant factor for predicting retention across any of the four years (Ryan & Glenn, 2003).

In 2004, Astin revisited his recommendation to estimate the expected retention rates of students based on entering characteristics mentioned in chapter two. In a research project examining the trends in access and equity, observed that the ability of high school GPA measures to predict persistence had weakened. His belief was that high school grades had become inflated and therefore were not weighted as heavily among admission criteria (Astin, 2004). This inflation was observed in the descriptive frequencies for the entering freshmen in this study as the range of high school GPA's began at 1.81 and topped-out at 5.28. This may account for the lack of effect observed in the equations.

Kuh's 2008 study reported that academic preparation had positive influences on college grades in the first and fourth year of college (2008). Wells (2008-2009) also found a composite test score in reading and math to positively predict persistence for years one and two. In this study, ACT Composite scores did not predict the likelihood of students persisting. In the fourth year, students were less likely to be retained by a factor of .80 for each one point increase in ACT Composite. Astin's 2005-2006 study concluded that academic preparation variables were the strongest predictors of degree completion. He stated that differences in degree completion rates among institutions were a reflection of the differences among the individual entering student bodies (2005-2006).

Arredondo and Knight (2006) observed in their analysis that students with high SAT scores participating in honors programs did not perform academically at expected

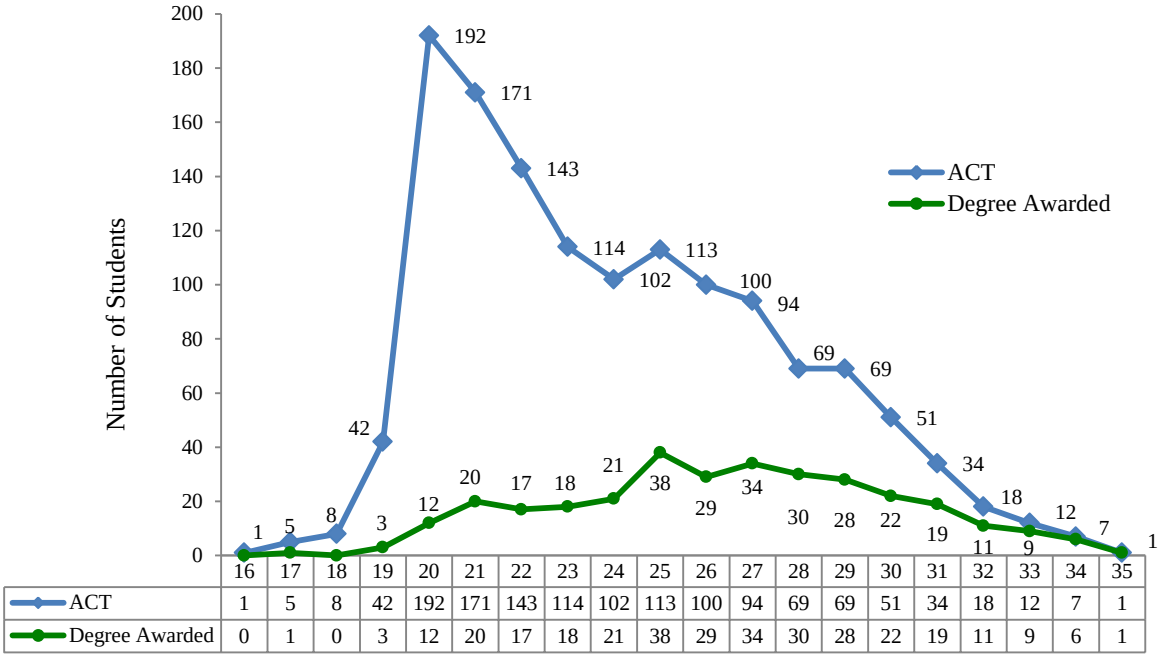
levels. Honors program participation was not a predictor of retention in the logistic regression models. However, when crosstabs were examined for degrees awarded, 24% of the entering students earned a degree by spring 2011. Of these 319 degrees, students participating in honors programs comprised 18% of the degrees awarded for this population.

Astin (2005) also identified academic preparation variables to be predictors of retention; however, ACT Composite scores did not predict retention in Years One through Three. In Year Four, the beta-weight of ACT Composite was negative indicating that a raise in ACT composite did not increase the likelihood of students remaining enrolled in Spring Four. For each one point increase in ACT Composite score, students were less likely to return for spring term in the Fourth Year by a factor of .80. Since degree attainment was coded as "retained" graduates would not have accounted for this result. However, there is a possibility that of the students who were not retained some may have entered professional schools not requiring the completion of a baccalaureate degree. As noted earlier, the institution has a strong emphasis in the STEM fields and offers a host of professional programs. Also, data were not collected beyond the spring semester therefore, it is unknown if students returned for a fifth fall term.

To further examine the academic performance of students by ACT score, degrees awarded were plotted by ACT. The average ACT score was 24. The distribution was positively skewed with the range being from 16 to 35. When plotting the students' ACT Composite scores with the number of degrees awarded, the ACT Composite score leveled-out with the number of degrees awarded to students with higher ACT scores.

Figure 1 displays the number of students by ACT Composite scores and the number obtaining degrees.

1. ACT Scores and Degrees Awarded to Students entering in the of Fall 2007 through Spring 2011



	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
ACT	1	5	8	42	192	171	143	114	102	113	100	94	69	69	51	34	18	12	7	1
Degree Awarded	0	1	0	3	12	20	17	18	21	38	29	34	30	28	22	19	11	9	6	1

ACT Composite Score and Number of Degrees Awarded

Of the 1,346 students, 319 or 24% of them completed a degree within the four-year academic time frame examined. The average ACT score for the group was 24. Students having an ACT Composite score of 24 or better had a degree attainment rate of 29% while students having a 23 or less had a degree attainment rate of 19%. Of the 56 students having a 16, 17, 18, or 19 ACT Composite score, only four (7%) of the students obtained a degree within the same time frame.

Family Background and Demographics

Five factors were targeted for examination in the area of family background and student characteristics. These factors were Ethnicity, Gender, First Generation, Unmet Financial Needs, and Pell Eligible. Of these five factors, the number of students identified as First Generation did not comprise enough of the population to be included in the logistic regression equations. However, a number of the studies reviewed provided insight into students who fit within this category.

Duggan's 2005 study sought to evaluate the effect of social capital on the retention of students who were first generation college students. Duggan's study found that first generation students who used email had retention rates similar to their peers. Also, first generation students who did not use email were less likely to be retained (Duggan, 2005).

Wells (2008) also examined the effect of social capital on student persistence. The results of his study found that students who had at least one parent who had earned a college degree were 2.73 times more likely to persist than students who were first generation (Wells, 2008).

Although the population of first generation students was not included in the logistic regression models, their frequencies and outcomes point to a lack of success at the university. There were only 24 students who self-identified as first generation on the entering application to the university. Of these 24, only 13 were retained into Year Two; 8 were retained into Year Three; and 7 were retained into Year Four. The U.S. Department of Education, National Center for Education Statistics (NCES) reported an 80% retention rate for first-time full-time freshmen starting in fall 2009 (2011). Further

study should be conducted to determine how better outcomes might be obtained for students entering the institution who are first generation college attendees.

Of the remaining four predictors for Family Background and Demographics, only Ethnicity was statistically significant. Students who reported their ethnicity as White, were more than twice as likely to be retained from year one to fall of year two and more than 2.7 times more likely to return their third year. In years three and four, ethnicity was not predictive of retention. The findings were similar to the studies discussed in the literature review. Hendel (2007), Johnson, (2008), Kuh et al. (2008), Oseguera (2006), Ryan and Glenn (2003), and Wells (2008) each observed ethnicity to be a variable influencing the likelihood of persistence.

Hendel's 2007 study examined the effects of first year seminars. He found that White students participating in the courses were more likely to persist (2007). Conversely, Kuh et. al. (2008) found that the positive effects of targeted institutional programming encouraged persistence equally across students of differing racial and ethnic groups in years one and two (2008). Completion rates for White students were higher in Oseguera's 2005 study while Wells's 2008-2009 study found that students possessing higher levels of social capital were more successful in college. Social capital was equally beneficial to students of all races and mitigated the effects of membership to low socioeconomic groups and/or minority groups (Wells, 2008-2009).

To better understand the educational participation and completion rates of students by ethnic and racial groups, the Digest of Education Statistics: 2010 was examined. The report indicated that the percent of high school dropouts had experienced a steady decline over the past 20 years across all groups. However, the percentage of

students not completing high school either by obtaining a diploma or equivalency was disparate. The dropout rate for Whites was 5.2%; for Blacks it was 9.3%; and for Hispanics it was 17.6%. Overall, the number of adults ages 25 and older who possessed high school diplomas rose from 84% to 87% between 2000 and 2010. The portion of young adults between the ages of 25 and 29 having completed high school remained the same for this period. The number of young adults completing a bachelor's degree rose from 29% to 32% (National Center for Education Statistics, 2011).

The College Navigator provided by NCES collects the retention and institutional data for higher education institutions and makes the data available to the public via the web. For students beginning in fall 2004, the institution of this study had an overall graduation rate of 41%. The 6-year graduation rate for White students was 43%; for Black or African American students it was 34%; and for Hispanic/ Latino students it was 37%. Students who were Asian/Native Hawaiian/ Pacific Islander had a graduation rate of 67% while students who were Non-resident alien had a rate of 59% for the same population of students entering in 2004. Students not reporting a race or ethnicity had a graduation rate of 41% (NCES, 2011).

Programs designed to support groups of students with lagging retention graduation and retention rates were described in a 2004 article by C. Keels. Outreach programs were recognized by the Noel-Levitz award program for their measurable outcomes, originality and effectiveness (Keels, 2004).

The schools recognized and their strategies to promote the persistence of traditionally underrepresented racial and economically-challenged groups were:

- Southeastern Oklahoma State University who offered structured academic advising that included degree maps for students, a college success course and freshman convocation to welcome first generation students and their families to campus;
- Georgia Institute of Technology who designed a summer program for students to learn strategies for college success;
- State University of New York at New Paltz who ended a long-running summer bridge program on their campus and replaced it with a summer orientation program that overlapped with the general orientation sessions and a freshman year experience course; and the
- University of North Carolina at Greensboro who restructured their academic probation policy and instituted a non-credit course with required attendance whereby students learned goal-setting, behavior modification principles and were asked to evaluate what they liked.

The schools each experienced measurable increases in retention rates for the targeted groups and made improvements in other calculable areas (2004).

It is recommended that the institution of study reevaluate the methods for identifying first-generation students and conduct a more in-depth analysis of between-group tests to determine the groups are performing at lower than expected rates. Once target groups are identified, existing student support programs can be evaluated and modified as needed to meet the needs of students.

Financial status was surprisingly not significant in any of the four regressions. Researchers Kuh et al. (2008) and Wells (2008) found instances in their research

indicating financing was an issue as it related to family background and other factors associated with low socioeconomic status. For this study, neither Unmet Financial Need nor Pell Eligibility predicted the retention status for students. In his 2000 paper, Lechuga predicted students would increasingly begin to rely on Pell Grants and potentially, be disappointed. For this reason, it may be fortunate that the findings for Pell Grant recipients in the study were not indicative of students not remaining enrolled (Lechuga, 2000). As discussed in the research design section, many fields in the data were addressing issues related to financial aid and the ability of students and their families to cover the price of tuition and fees. It is recommended that the institution revisit the financial aid measures to determine if more appropriate data are needed to analyze the effects of merit-based scholarships, need-based support, student loans, and other means of financial assistance and the effects on persistence.

Institutional Constructs

Advising. Advising was predictive of retention in Year One. The freshmen who attended advising appointments were 1.2 times more likely to persist with each additional visit to their academic advisor. Year One was the only year that netted a significant contribution to the model. In the literature review, researchers Carini et al. (2006) found partial correlations with advising and seniors' retention while Lowe and Toney (2000) examined the quality of advising and student satisfaction with the appointments. This study contrasted with these findings in that the quality of advising was not addressed. However, the findings indicated that freshmen retention benefitted from the interactions.

Bai and Pan (2009-2010) also found advising to encourage retention rates for first year entering freshmen. The result they observed also indicated that advising programs had stronger effects for institutions with more selective admission criteria (2009-2010). J. Dudek et al. (2005) presented a case study of methods for advising students in honors programs. They recommended that students be taught to prepare for advising sessions in advance. Preparing directed questions allowed students to maximize the benefits of meeting with their academic advisors (Dudek et al., 2005).

Since Advising was a statistically significant contributor to the logistic regression model for Year One, a more comprehensive approach to the advising model for the university may be warranted to identify how academic advising may be structured to affect retention rates of upper classmen as well as improve the current retention rates for first and second year students.

A related predictor was Change in Major. Researchers who examined changing majors as it is related to retention were Astin (1997), Oseguera (2006) and Arredondo and Knight (1996). Of these, specific majors were recommended for further review as well as institutional curriculum decisions such as the sequencing of courses and role of disciplines in promoting retention (Arrendondo & Knight, 1996; Astin, 1997; Oseguera, 2006; and Arendondo & Knight, 1996).

The institution has a policy regarding students changing majors that allows students to change majors without the approval of an advisor or faculty member. The student information system only collects the major of record at the close of the semester each term Therefore, the number of times a student has entered the system and chosen a different major might not be reflected precisely in the data (Scott R., personal

communication, October, 2011). It is interesting that the predictor was a positive predictor for retention in Year One but a negative predictor in Year Four. Further study should examine the choices of majors students make the factors that influence a change and the effects participation in majors may have on persistence.

Engagement. Student Engagement was examined for its role in predicting retention. The variable did not increase the likelihood of students returning for Spring Four and was not a statistically significant factor in Year One, Two, or Three. In Year Four, students who enrolled in courses incorporating Undergraduate Research, Service Learning, or Study Away components were .41 times less likely to be retained for each additional course taken. This outcome is curious as a number of researchers have observed the positive benefit of students becoming involved in courses designed to have increased faculty interaction, community service components, and research methodologies at the undergraduate level. Carini, Klein and Kuh (2006), Kuh et al. (2008), and the National Survey of Student Engagement (NSSE) each observed positive effects of incorporating these types of courses into undergraduate curricula.

Kuh et al. (2008) determined that student engagement variables were positively related to on first-year grades and continued enrollment from the first year to the second. Therefore, it is recommended a further investigation into the students enrolling in the courses identified and examination of the specific traits associated with this group. It is possible the students were high performers who transferred to other schools or entered professional programs prior to completing an undergraduate degree at this institution. The Carnegie Classification for the undergraduate program was Arts and Sciences balanced

with Professions (Carnegie, 2012). Only a critical evaluation of the specific groups can reveal if this is an accurate picture or if there are problems with the data housed in the student information system.

Freshman Year Experience. This study found that participation in Freshman Year Experience Courses was significant for predicting retention in Year Two. However, the direction of the beta weight was negative indicating that participation in an FYE did not encourage retention. The students in the dataset completing Freshman Year Experience courses were .37 times less likely to be retained. This result may be due to the combination of FYE and U101 course completions serving as the measure. Traditionally, U101 courses were recommended for students who entered the institution with indicators of academic difficulty. Although the course satisfied the requirement that incoming first-time freshmen enroll in an FYE (as discussed previously) the results may have been skewed by a disproportionate number of students with lower ACT scores and/or High School GPA's.

Last, as discussed earlier in the methods section, FYE's became a requirement of the institution in 2007. However, the data did not contain any record of students completing FYE courses in Fall 2007. The measure did not appear in the student data until Fall of 2008. Independently, the sample of students enrolling in FYE's did not comprise even ten percent of the population to allow the predictor to be included in the model. Therefore, question of the accuracy of the student data system to reflect the actual number of students who completed FYE's was in question.

Change in Major. Having a Change in Major was Significant in Year One and Four for predicting retention. Neither Early Alert nor Honors programs made statistically significant contributions to the models. Hudson's 2005 article attempted to measure the effect of an early warning system for students whose performance may have indicated academic difficulty (Hudson, 2005). The results of this study did not support or contradict the assumption that a system of contacting students whose performance is not commensurate with faculty expectations is an effective means for encouraging retention.

Housing. The students who lived on campus in university housing were more likely to be retained in Year One by a factor of 1.46. The predictor was only statistically significant for Year One. However, this outcome is commensurate with other retention research. Potts, Schultz, and Foust (2004) found that living on campus had a positive effect on students' academic achievement. Astin (1997) recommended that universities require students to live on campus. The institution in this study was making a transition from being a largely commuter campus to having a campus-feel with university housing. In recent years, a new dining hall, dorm, and recreation center were constructed. Streets in the center of campus were closed and a green area designed and opened for students, faculty and staff. As the campus continues to offer student services and on-campus support, additional programs to reach students could be designed around the residence halls.

Supplemental Instruction. The final predictor included in the logistic regression analyses was Supplemental Instruction (SI). As discussed previously, this was a method whereby students taught other students outside of the classroom in disciplines that were traditionally difficult. It is interesting to observe the outcome of the analysis for this area as the predictor was only significant in the Year Four model. The program is largely run by students and managed by the advising office for the College of Arts and Sciences. The College delivers a majority of the core curriculum for undergraduates. To determine if the influx of SI sessions could be due to leaders also being included in the data, I sent an inquiry to Ramsey Scott, Assistant Director of Computing Services. Since he originally helped to construct the data collection methods for SI he was also able to check the raw data.

Scott verified the data results by reviewing a number of the course participation reports. He explained that the system had been configured to only record attendees using class rosters. Leaders of the sessions could not have been recorded as participants because they were not listed on the rosters. Scott's conclusion was, "Students who are already serious about graduating are the ones who attend SI sessions" (R. Scott, personal communication, March 13, 2012).

The finding that participating in tutoring sessions was predictive of retention was in keeping with studies discussed in the literature review. Engle et al. (2004) and Ryan and Glenn (2003) found that students taking study skills instruction courses performed better academically and had higher retention rates. The study Engle et al. conducted targeted at-risk students and focused on study techniques, test taking strategies, and career skills training. The implementation of the program lasted for a duration of 12

weeks. Twenty six percent more of the students who participated enjoyed an improved GPA as compared to students who did not attend. Additionally, lasting effects were observed. Twenty seven percent more of the participants continued to experience success compared to the other students and they had higher retention rates (Engle et al., 2004).

Ryan and Glenn (2002-2003) conducted a longitudinal study of retention rates. They also targeted students who had been identified as at-risk by the institution's academic probation policies. By increasing supplemental instruction offerings they saw a 10% improvement in retention rates for students on academic probation (2002-2003).

Recommendations

The literature review opened with the perspectives of two different approaches to college retention. Astin sought to show that background characteristics of students such as high school performance and pre-college testing could predict student persistence in higher education. Tinto dedicated his research to examining the strategies higher education institutions can employ to involve students in the campus culture to promote retention. This study sought to identify the variables associated with retention that predict the likelihood of students remaining enrolled. It examined background characteristics, academic preparation and performance traits, and institutional constructs. The results revealed that each of the areas were significant at different points in the students' undergraduate careers.

Recommendations for Academic Preparation and Performance

Since it is generally accepted in college retention literature that ACT Scores contribute positively to predicting retention, further investigation should be conducted to understand the negative correlation of ACT scores with retention rates at this institution in the fourth year of enrollment.

Questions that could be addressed include:

Are students with higher than average ACT Composite scores leaving to enter professional schools not requiring baccalaureate degrees for entry?

Are students transferring to other higher education institutions?

What are the demographics of students with higher than average ACT Composite scores who leave before obtaining a degree?

How can student engagement programs affect these graduation rates?

Recommendations for Family Background and Demographics

The study institution was ranked by The Princeton Review as being a diverse campus. In fact, it was number five on the list only behind Loyola University New Orleans, Stanford University, the University of Miami, and Franklin W. Olin College of Engineering (Princeton Review, 2012). However, the results of the analyses showed that students who were White were more likely to be retained than students who were Black or another ethnicity. After the first year, 60% of White students returned for the second fall. After the second year, 84% of the students who were White returned for the third year. The institution should further examine the differences between the groups of students retained versus not retained by ethnic group and examine the nature of the

differences among corresponding student characteristics. Suggested questions for investigation include:

Are racial or ethnic groups equally represented in programs targeted for improving retention?

Did the students who left the institution participate in institutional programs designed to encourage retention?

What programs are other institutions implementing that are having success at making college more accessible?

Recommendations for Institutional Constructs

Of the eight predictors for Institutional Constructs reviewed, advising, early alerts, change of major, student engagement, supplemental instruction, freshman year experience, and honors, were significant. none were significant predictors for Year Two and Year Three. To determine the needs of students at the sophomore and junior class standing, research should be conducted both in a literature review and on-campus qualitative analysis. The metrics have not yet been consistently identified for this particular campus or population.

Second, a review of the types of transcript requests correlated with GPA could resolve the open issues regarding the students who leave in later years of enrollment. The National Student Clearinghouse is a service that works with higher education to verify degrees and certificates of students. Working closely with this organization could help to provide information regarding the degree completion status of students (National Student Clearinghouse, 2012). Knowing the student outcomes may not improve the graduation rate reported for individual institutions, but it may prove to inform schools of where they

are losing students and help with ways to approach addressing retention with more targeted approaches.

Third, Kuh (2001-2002) stated, "The keys to developing a success-oriented institutional culture is to capture the power of the peer group and to focus on the classroom as the primary locus of culture building" (p. 37). He provided six steps for colleges to follow to create the "success oriented campus culture" (p. 32). They were

1. clarify institutional values and expectations early and often to prospective and matriculating students,
2. conduct a comprehensive examination of the student experience inside and outside the classroom,
3. consistently use good practices in teaching, learning, and retention programs,
4. intentionally tie the curriculum to students' lives outside the classroom to bring students into ongoing contact with one another and with campus resources, especially after the first year of study,
5. remove obstacles to student success associated with disciplinary cultures, and
6. determine the effects of proximal peer groups on persistence (p. 32-36).

Given the retention and graduation rates reported for the institution discussed earlier, it is important an instructional evaluation is conducted. This structured approach can serve to inform decision-makers of the programs needed for cultivating a campus culture that promotes student success (Kuh, 2001-2002).

Finally, in addressing freshman year experience courses it was revealed that the data in the student information system may not be accurate. Therefore, an audit of the system for the measures associated with student retention should be conducted.

Conclusion

This study sought to analyze the relationship between student variables associated with student persistence and their ability to predict continued enrollment. The literature review discussed the findings of predictive institutional models, institutional constructs, student characteristics, and intervention strategies institutions have designed for the purpose of encouraging retention. The analyses found that for this higher education institution, elements of each of the areas had statistically significant values for predicting retention. The data used for analysis consisted of 1,346 students. Of these, 851 were retained to the fourth year or received degrees. This is a 62% rate of retention. Although this is an improvement over Tinto's assertion that, "more students leave their college or university prior to degree completion than stay (Tinto, 1993, p. 1) much should be done to improve outcomes for students for the benefit of themselves and society as a whole. Both Astin and Tinto's theories for retention were supported in part by the findings.

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A: DATA DICTIONARY FOR RETENTION DATABASE

Retention db column	Description
ACADEMIC_PERIOD	academic period of admission
ACTCO	highest ACT composite score
ACTEH	ACT English subtest associated with highest composite score
ACTMA	ACT Math subtest associated with highest composite score
ADM_APP_DATE	application date
ADM_APPEALS	0/1 - admitted on appeal
ADM_CONDITIONAL	0/1 - conditional admit
ADM_DECISION	admission decision code - Admitted, Withdrawn, Denied, etc. - see "admission codes" worksheet
ADM_DECISION_DATE	admission decision date
ADM_POP	admission population - Regular, Concurrent, Conditional, etc. - see "admission codes" worksheet
ADM_REGULAR	0/1 - regular admit
ADM_STU_POP	student population; F: beginning freshman
AGE	age as of September 1 of their HS grad year
AL	0/1 - from Alabama
ATHLETE	0/1 - student is/was coded as an athlete. Does NOT imply current status
BMEN	0/1 - in Blazer Male Excellence Network program - does NOT imply student is currently in program
CAMPUS_VISIT	0/1 - student visited campus prior to admission
CITIZENSHIP_TYPE	US vs. non-resident alien, etc.
CITIZENSHIP_TYPE_NA	0/1 - nonresident alien
CITIZENSHIP_TYPE_NP	0/1 - noncitizen permanent resident
CITIZENSHIP_TYPE_NULL	0/1 - null
CITIZENSHIP_TYPE_U	0/1 - unknown
CITIZENSHIP_TYPE_Y	0/1 - US citizen
COLLEGE_FA1	college code, first fall semester
COLLEGE_SP1	college code, first spring semester
CON_AAA	0/1 - see "contact" worksheet for legend
CON_AGC	0/1 - see "contact" worksheet for legend
CON_ALW	0/1 - see "contact" worksheet for legend
CON_APC	0/1 - see "contact" worksheet for legend
CON_ATH	0/1 - see "contact" worksheet for legend
CON_BUS	0/1 - see "contact" worksheet for legend
CON_CD	0/1 - see "contact" worksheet for legend
CON_CON	0/1 - see "contact" worksheet for legend
CON_COR	0/1 - see "contact" worksheet for legend
CON_CT	0/1 - see "contact" worksheet for legend
CON_CT1	0/1 - see "contact" worksheet for legend
CON_CT2	0/1 - see "contact" worksheet for legend
CON_CT3	0/1 - see "contact" worksheet for legend
CON_CUS	0/1 - see "contact" worksheet for legend

Retention db column	Description
CON_CVW	0/1 - see "contact" worksheet for legend
CON_DCE	0/1 - see "contact" worksheet for legend
CON_DLW	0/1 - see "contact" worksheet for legend
CON_EAL	0/1 - see "contact" worksheet for legend
CON_EMR	0/1 - see "contact" worksheet for legend
CON_ENS	0/1 - see "contact" worksheet for legend
CON_ES	0/1 - see "contact" worksheet for legend
CON_FAA	0/1 - see "contact" worksheet for legend
CON_FUD	0/1 - see "contact" worksheet for legend
CON_GCP	0/1 - see "contact" worksheet for legend
CON_IDD	0/1 - see "contact" worksheet for legend
CON_M	0/1 - see "contact" worksheet for legend
CON_MC	0/1 - see "contact" worksheet for legend
CON_MCG	0/1 - see "contact" worksheet for legend
CON_MCW	0/1 - see "contact" worksheet for legend
CON_NAC	0/1 - see "contact" worksheet for legend
CON_NAS	0/1 - see "contact" worksheet for legend
CON_NHR	0/1 - see "contact" worksheet for legend
CON_NS	0/1 - see "contact" worksheet for legend
CON_NSF	0/1 - see "contact" worksheet for legend
CON_NSM	0/1 - see "contact" worksheet for legend
CON_OTH	0/1 - see "contact" worksheet for legend
CON_OTM	0/1 - see "contact" worksheet for legend
CON_PHR	0/1 - see "contact" worksheet for legend
CON_PSA	0/1 - see "contact" worksheet for legend
CON_PV	0/1 - see "contact" worksheet for legend
CON_REC	0/1 - see "contact" worksheet for legend
CON_SEA	0/1 - see "contact" worksheet for legend
CON_SPH	0/1 - see "contact" worksheet for legend
CON_SPP	0/1 - see "contact" worksheet for legend
CON_SS	0/1 - see "contact" worksheet for legend
CON_SSB	0/1 - see "contact" worksheet for legend
CON_SSI	0/1 - see "contact" worksheet for legend
CON_TAP	0/1 - see "contact" worksheet for legend
CON_TUB	0/1 - see "contact" worksheet for legend
CON_UAD	0/1 - see "contact" worksheet for legend
CON_UBD	0/1 - see "contact" worksheet for legend
CON_WAP	0/1 - see "contact" worksheet for legend
CON_WEB	0/1 - see "contact" worksheet for legend
CON_WHO	0/1 - see "contact" worksheet for legend
CON_WIN	0/1 - see "contact" worksheet for legend
CON_WLK	0/1 - see "contact" worksheet for legend

Retention db column	Description
CON_WRI	0/1 - see "contact" worksheet for legend
CONTIGUOUS	0/1 - from state bordering Alabama
CUM_GPA_FA1	cumulative overall GPA after first fall semester
CUM_GPA_SP1	cumulative overall GPA after first spring semester
CUM_HRSATT_FA1	cumulative hrs attempted after first fall semester
CUM_HRSATT_SP1	cumulative hrs attempted after first spring semester
DEGREE_AWARDED	0/1 - student was awarded a degree from UAB
DUAL_ENR	0/1 - dual-enrolled for academic period in first field
EH_NATIVE_LANGUAGE	0/1
ETHNICITY_A	0/1 - Asian
ETHNICITY_B	0/1 - black
ETHNICITY_H	0/1 - Hispanic
ETHNICITY_I	0/1 - American Indian
ETHNICITY_M	0/1 - multi-cultural
ETHNICITY_NULL	0/1 - blank
ETHNICITY_O	0/1 - other
ETHNICITY_U	0/1 - unreported
ETHNICITY_W	0/1 - white
FA_ATH_PAID1	total athletic scholarship aid PAID in first academic year
FA_ATH_PAID2	total athletic scholarship aid PAID in second academic year
FA_COE1	cost of education, first academic year
FA_COE2	cost of education, second academic year
FA_DEC_CAN1	total aid declined or cancelled, first academic year
FA_DEC_CAN2	total aid declined or cancelled, second academic year
FA_HOUS_PAID1	total housing stipend PAID in dollars, all sources - first academic year
FA_HOUS_PAID2	total housing stipend PAID in dollars, all sources - second academic year
FA_MERIT_PAID1	total merit scholarship PAID in dollars, all sources - first academic year
FA_MERIT_PAID2	total merit scholarship PAID in dollars, all sources - second academic year
FA_NB_GRANT_PAID1	total grant amounts PAID - first academic year
FA_NB_GRANT_PAID2	total grant amounts PAID - second academic year
FA_NB_LOAN_PAID1	total loan amounts PAID - first academic year
FA_NB_LOAN_PAID2	total loan amounts PAID - second academic year
FA_NB_WRKSTDY_PAID1	total work-study amounts PAID - first academic year
FA_NB_WRKSTDY_PAID2	total work-study amounts PAID - second academic year
FA_NEED_GAP1	total need minus the sum of ALL aid awarded from ALL sources, first academic year
FA_NEED_GAP2	total need minus the sum of ALL aid awarded from ALL sources, second academic year
Pell Eligible	0/1 - student Eligible for Pell Grant in their FIRST academic year
FA_TFC1	total family contribution per ISIR, first academic year
FA_TFC2	total family contribution per ISIR, second academic year
FA_TOT_AW1	total financial aid award in dollars, all sources - first academic year
FA_TOT_AW2	total financial aid award in dollars, all sources - second academic year

Retention db column	Description
FA_TOT_NEED1	cost of education minus total family contribution, first academic year
FA_TOT_NEED2	cost of education minus total family contribution, second academic year
FA_TOT_PAID1	total aid PAID in dollars, first academic year
FA_TOT_PAID2	total aid PAID in dollars, second academic year
FA_UNMET1	total need minus sum of all institutional funds awarded, first academic year
FA_UNMET2	total need minus sum of all institutional funds awarded, second academic year
FIRST_GEN	0/1 - 1st-generation college student
FURTHER	0/1 - from a state outside of AL or bordering state
GENDER	gender
GENDER_F	0/1 - female
GENDER_M	0/1 - male
GENDER_N	0/1 - unknown/not given
GPA_FA1	term GPA, first fall semester
GPA_SP1	term GPA, first spring semester
HO_DISTANCE_FR_UAB	permanent zip code - distance from UAB campus
HO_POSTAL_CODE	permanent zip; may change over time
HO_STATE_PROVINCE	permanent state
HON_EMSA	0/1 - in EMSAP program - does NOT imply student is currently in program
HON_GCL	0/1 - in Global/Comm Leadership program - does NOT imply student is currently in program
HON_HP	0/1 - in UAB Honors program - does NOT imply student is currently in program
HON_STHP	0/1 - in Science/Technology Honors program - does NOT imply student is currently in program
HOUSINGYR1	0/1 - lived in university housing in their first year
HRSATT_FA1	hrs attempted, first fall semester
HRSATT_SP1	hrs attempted, first spring semester
HS_CODE	unique 6-digit HS code
HS_COUNTY	county code of HS
HS_COUNTY_DESC	county description
HS_DESC	HS description (long name)
HS_GPA	overall High School GPA, for admission purposes
HS_GRADYR	4-digit grad year
HS_POSTAL_CODE	zip code of HS
HS_RANK	rank in Sr. class
HS_SIZE	reported by ACT testing service
JEFFCO_AREA	0/1 - from Jefferson/Bibb/Blount/Shelby/St. Clair/Tuscaloosa/Walker
MSRP	*in process - not yet populated
NATIONAL_MERIT	0/1 - National Merit Finalist / semi Finalist
NATIONAL_MERIT_NMF	0/1 - National Merit Finalist
NATIONAL_MERIT_NMS	0/1 - National Merit semi Finalist
PDEN	0/1 - indicated interest in pre-dentistry

Retention db column	Description
PERSON_UID	internal unique ID
PLACE_EH	English course student placed in - 091, 101, 102, or 200
PLACE_MA098	0/1 - student placed in this course
PLACE_MA102	0/1 - student placed in this course
PLACE_MA105	0/1 - student placed in this course
PLACE_MA106	0/1 - student placed in this course
PLACE_MA107	0/1 - student placed in this course
PLACE_MA109	0/1 - student placed in this course
PLACE_MA110	0/1 - student placed in this course
PLACE_MA123	0/1 - student placed in this course
PLACE_MA125	0/1 - student placed in this course
PLAW	0/1 - indicated interest in pre-law
PMED	0/1 - indicated interest in pre-medicine
PNA	0/1 - indicated interest in pre-nursing assistant
POPT	0/1 - indicated interest in pre-optometry
POT	0/1 - indicated interest in pre-occupational therapy
PPHA	0/1 - indicated interest in pre-physicians assistant
PPT	0/1 - indicated interest in pre-physical therapy
PRIMARY_ETHNICITY	condensed version - does not use new race coding methodology
PSPA	0/1 - indicated interest in pre-surgical physician's assistant
TAKEN_EH	0/1 - student has taken the English course in which they placed
TAKEN_EH091	0/1 - student has taken this course
TAKEN_EH101	0/1 - student has taken this course
TAKEN_EH102	0/1 - student has taken this course
TAKEN_EH200	0/1 - student has taken this course
TAKEN_MA098	0/1 - student has taken this course
TAKEN_MA102	0/1 - student has taken this course
TAKEN_MA105	0/1 - student has taken this course
TAKEN_MA106	0/1 - student has taken this course
TAKEN_MA107	0/1 - student has taken this course
TAKEN_MA109	0/1 - student has taken this course
TAKEN_MA110	0/1 - student has taken this course
TAKEN_MA123	0/1 - student has taken this course
TAKEN_MA125	0/1 - student has taken this course
TAKEN_UNIV101	0/1 - student has taken this course
THRU_TERM	retention db data current through this term

B: DISTRIBUTION STATISTICS OF CATEGORICAL VARIABLES

Categorical Variables	N	Missing	Sum	%
ENGLISH 091	1,346	0	14	1.00
MATH 098	1,346	0	66	5.00
FRESHMAN YEAR EXP	1,346	0	235	17.00
DEGREE AWARDED	1,346	0	319	24.00
WHITE	1,346	0	838	62.00
FEMALE	1,346	0	789	59.00
FIRST GENERATION	1,346	0	24	2.00
FYE YR1	1,346	0	0	0.00
FYE YR2	1,346	0	64	5.00
FYE YR3	1,346	0	16	1.00
FYE YR4	1,346	0	14	1.00
HONORS	1,346	0	107	8.00
HOUSING YR1	1,346	0	814	60.00
RETAINED YR2	1,346	0	938	70.00
RETAINED YR2	1,346	0	938	70.00
RETAINED YR3	1,346	0	833	62.00
RETAINED YR4	1,346	0	801	60.00

C: DISTRIBUTION STATISTICS FOR CONTINUOUS VARIABLES

Variables	M	SE	SD	Variance	Range	Min	Max
ACT COMPOSITE	24.08	.10	3.61	13.06	19.00	16.00	35.00
ADVISING TO. Y2	5.30	.10	3.54	12.51	23.00	.00	23.00
ADVISING TO. Y3	7.40	.14	4.98	24.76	32.00	.00	32.00
ADVISING TO. Y4	9.21	.18	6.58	43.35	4.00	.00	4.00
ADVISING Y1	2.54	.05	1.97	3.89	14.00	.00	14.00
ADVISING Y2	2.76	.07	2.42	5.83	16.00	.00	16.00
ADVISING Y3	2.10	.06	2.31	5.34	19.00	.00	19.00
ADVISING Y4	1.81	.07	2.53	6.39	17.00	.00	17.00
AGE	18.07	.02	.77	.59	22.00	16.00	38.00
ENGAGEMENT TO Y2	.03	.01	.20	.04	2.00	.00	2.00
ENGAGEMENT TO Y3	.14	.01	.49	.24	5.00	.00	5.00
ENGAGEMENT TO Y4	.31	.02	.77	.59	6.00	.00	6.00
ENGAGEMENT Y1	.00	.00	.04	.00	1.00	.00	1.00
ENGAGEMENT Y2	.03	.01	.19	.04	2.00	.00	2.00
ENGAGEMENT Y3	.10	.01	.38	.14	3.00	.00	3.00
ENGAGEMENT Y4	.17	.01	.46	.21	3.00	.00	3.00
CUM GPA SPRING1	2.55	.03	1.12	1.25	4.00	.00	4.00
CUM GPA SPRING2	2.19	.04	1.39	1.94	4.00	.00	4.00
CUM GPA SPRING3	1.97	.04	1.52	2.30	4.00	.00	4.00
EARLY ALERT TO Y2	1.69	.05	1.84	3.40	11.00	.00	11.00
EARLY ALERT TO Y3	2.34	.07	2.48	6.13	15.00	.00	15.00
EARLY ALERT TO Y4	2.63	.08	2.82	7.98	16.00	.00	16.00
EARLY ALERT Y1	.71	.03	1.01	1.03	6.00	.00	6.00
HIGH SCHOOL GPA	3.46	.02	.66	.43	3.47	1.81	5.28
HOUSING TO. Y2	.95	.02	.85	.72	2.00	.00	2.00
HOUSING TO. Y3	1.15	.03	1.12	1.25	3.00	.00	3.00
HOUSING TO. Y4	1.24	.04	1.29	1.66	4.00	.00	4.00
MAJOR CHANGE TO Y2	.76	.03	1.13	1.27	6.00	.00	6.00
MAJOR CHANGE TO. Y3	1.06	.03	1.24	1.53	6.00	.00	6.00
MAJOR CHANGE TO. Y4	1.06	.03	1.24	1.53	6.00	.00	6.00
MAJOR CHANGE Y1	.38	.02	.56	.32	3.00	.00	3.00
MAJOR CHANGE Y2	.38	.02	.56	.32	3.00	.00	3.00
MAJOR CHANGE Y3	.30	.01	.51	.26	3.00	.00	3.00
MAJOR CHANGE Y4	.16	.01	.41	.17	3.00	.00	3.00
RETAINED Y1	.79	.01	.40	.16	1.00	.00	1.00
SI TO.Y3	4.39	.32	11.83	139.86	110.00	.00	110.00
SI TO.Y4	4.68	.34	12.41	154.02	110.00	.00	110.00
SI Y1	.00	.00	.00	.00	.00	.00	.00
SI Y2	3.18	.24	8.80	77.47	83.00	.00	83.00
UNMET NEED Y1	-76.00	184.00	6757.00	45658398.00	53416.00	-31103.00	22313.00
UNMET NEED Y2	-274.00	176.00	6482.00	42020709.00	54033.00	-31695.00	22338.00
UNMET NEED Y3	-317.00	172.00	.006316.00	39894713.00	55616.00	-30559.00	25057.00
UNMET NEED Y4	-241.00	164.00	6031.00	36382556.00	58657.00	-30148.00	28509.00

Supplemental Instruction (SI), Year One (Y1), Year Two (Y2), Year Three (Y3), Year Four (Y4); Total (TO)

D: MATH MATRIX

ACT/SAT MATH SUBSCORE/GPA GRID			
SAT Math Subscore	**ACT Math Subscore**	**High School Core GPA**	**UAB Math Course**
	If not placed as indicated below		**Math 098 Basic/Elementary Algebra**
> = 480	> = 20	> = 2.0	**MA 110 Finite Mathematics**
> = 500	> = 21	na	
> = 480	> = 20	> = 2.5	**MA 102 Intermediate Algebra**
> = 500	> = 21	na	
> = 520	> = 22	> = 3.5	**MA 105 Precalculus Algebra**
> = 540	> = 23	> = 3.0	
> = 560	> = 24	> = 2.5	
> = 580	> = 25	na	
> = 540	> = 23	> = 3.5	**MA 109 Survey of Calculus (Business Majors)**
> = 560	> = 24	> = 3.0	
> = 580	> = 25	> = 2.5	
> = 600	> = 26	na	
> = 560	> = 24	> = 3.5	**MA 107 Precalculus Algebra/Trig**
> = 580	> = 25	> = 3.0	
> = 600	> = 26	> = 2.5	
> = 620	> = 27	na	
> = 580	> = 25	> = 3.5	**MA 106 Precalculus Trigonometry**
> = 600	> = 26	> = 3.0	
> = 620	> = 27	na	
> = 580	> = 25	> = 3.5	**MA 123 Calculus with Functions I (Life Sciences)**
> = 600	> = 26	> = 3.0	
> = 620	> = 27	na	
> = 580	> = 25	> = 3.5	**MA 125 Calculus I (Requires Trigonometry)**
> = 600	> = 26	> = 3.0	
> = 620	> = 27	na	

na means GPA is not applicable
> = means greater than or equal to

E: YEAR ONE CORRELATIONS AND SIGNIFICANCE

Variable	Correlations	A	B	C	D	E	F	G	H
I	Correlation	-.026	.548**	-.084**	.373**	-.215**	.079**	-.466**	.001
	Sig. (2-tailed)	.333	.000	.002	.000	.000	.004	.000	.979
H	Correlation	.024	.020	.012	.101**	-.016	-.026	-.065*	
	Sig. (2-tailed)	.372	.456	.654	.000	.560	.341	.017	
G	Correlation	.003	-.292**	.014	-.308**	.212**	-.062*		
	Sig. (2-tailed)	.902	.000	.606	.000	.000	.022		
F	Correlation	-.029	.055*	-.001	.042	-.027			
	Sig. (2-tailed)	.295	.045	.975	.125	.322			
E	Correlation	-.038	-.289**	.056*	-.425**				
	Sig. (2-tailed)	.168	.000	.040	.000				
D	Correlation	-.061*	.545**	.116**					
	Sig. (2-tailed)	.025	.000	.000					
C	Correlation	-.066*	.058*						
	Sig. (2-tailed)	.016	.034						
B	Correlation	-.097**							
	Sig. (2-tailed)	.000							

A: Age; B: High School GPA; C: Advising; D:Cumulative GPA; E: Early Alert; F: Engagement; G: Unmet Need; H: Change of Major; I: ACT Composite Sig. (2-tailed)=Significance**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). *n*=1,346

F: YEAR TWO CORRELATIONS AND SIGNIFICANCE

Variable	Correlations	K	J	I	H	G	F	E	D	C	B
A	Correlation	.228**	.121**	-.385**	-.033	-.090**	.416**	.248**	-.456**	.565**	-.038
	Sig. (2-tailed)	.000	.000	.000	.282	.003	.000	.000	.000	.000	.205
B	Correlation	-.053	-.043	.021	.042	-.049	-.033	-.132**	-.002	-.079*	
	Sig. (2-tailed)	.080	.160	.489	.164	.104	.277	.000	.941	.009	
C	Correlation	.177**	.178**	-.399**	-.039	.020	.487**	.194**	-.253**		
	Sig. (2-tailed)	.000	.000	.000	.195	.501	.000	.000	.000		
D	Correlation	-.166**	-.029	.259**	-.021	.027	-.275**	-.145**			
	Sig. (2-tailed)	.000	.344	.000	.483	.376	.000	.000			
E	Correlation	.131**	.155**	-.020	-.007	.204**	.243**				
	Sig. (2-tailed)	.000	.000	.500	.825	.000	.000				
F	Correlation	.168**	.253**	-.496**	.035	.090*					
	Sig. (2-tailed)	.000	.000	.000	.242	.003					
G	Correlation	.090*	.101*	.145**	.022						
	Sig. (2-tailed)	.003	.001	.000	.472						
H	Correlation	-.048	-.075*	.004							
	Sig. (2-tailed)	.111	.014	.905							
I	Correlation	-.126**	-.139**								
	Sig. (2-tailed)	.000	.000								

A: ACT Composite; B: Age; C: High School GPA; D: Unmet Need: E: Housing; F: Cumulative GPA; G: Advising; H: Change of Major; I: Early Alert; J: Supplemental Instruction; K: Engagement Courses
Sig. (2-tailed)=Significance
**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed). *n*=1088

G: YEAR THREE CORRELATIONS AND SIGNIFICANCE

Var.	Correlations	K	J	I	H	G	F	E	D	C	B
A	Correlation	.249**	.058	-.424**	-.111*	-.074	.394**	.298**	-.468**	.583**	-.041
	Sig. (2-tailed)	.000	.075	.000	.001	.022	.000	.000	.000	.000	.204
B	Correlation	-.052	-.043	.002	.024	-.057	-.039	-.116**	.024	-.074	
	Sig. (2-tailed)	.107	.189	.947	.463	.081	.229	.000	.466	.022	
C	Correlation	.188**	.135**	-.412**	-.079	-.002	.458**	.224**	-.295**		
	Sig. (2-tailed)	.000	.000	.000	.015	.957	.000	.000	.000		
D	Correlation	-.187**	-.007	.315**	.033	.015	-.301**	-.198**			
	Sig. (2-tailed)	.000	.835	.000	.311	.644	.000	.000			
E	Correlation	.164**	.174**	-.064	-.019	.176**	.202**				
	Sig. (2-tailed)	.000	.000	.050	.552	.000	.000				
F	Correlation	.210**	.199**	-.561**	-.007	-.007					
	Sig. (2-tailed)	.000	.000	.000	.833	.819					
G	Correlation	.175**	.150**	.134**	-.034**						
	Sig. (2-tailed)	.000	.000	.000	.293						
H	Correlation	-.138**	-.119**	.023							
	Sig. (2-tailed)	.000	.000	.471							
I	Correlation	-.190**	-.061								
	Sig. (2-tailed)	.000	.061								
J	Correlation	.145**									
	Sig. (2-tailed)	.000									

Var.: Variable; A: ACT Composite; B: Age; C: High School GPA; D: Unmet Need; E: Housing; F: Cumulative GPA; G: Advising; H: Change of Major; I: Early Alert; J: Supplemental Instruction; K: Engagement Courses
Sig. (2-tailed)= Significance; ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). *n*=951

H: YEAR FOUR CORRELATIONS AND SIGNIFICANCE

Variable	Correlations	J	I	H	G	F	E	D	C	B
A	Correlation	.245**	.039	-.417	-.183	-.100	.250	.326	.579	-.039
	Sig. (2-tailed)	.000	.251	.000	.000	.004	.000	.000	.000	.251
B	Correlation	-.038	-.042	-.003	.013	-.063	-.099	-.115	-.071	
	Sig. (2-tailed)	.264	.221	.925	.702	.067	.004	.001	.037	
C	Correlation	.238**	.118**	-.413	-.123	-.025	.337	.238		
	Sig. (2-tailed)	.000	.001	.000	.000	.460	.000	.000		
D	Correlation	.131**	.180**	-.113	-.062	.131	.176			
	Sig. (2-tailed)	.000	.000	.001	.069	.000	.000			
E	Correlation	.276**	.140**	-.442	-.037	.037				
	Sig. (2-tailed)	.000	.000	.000	.277	.280				
F	Correlation	.182**	.227**	.184	-.076					
	Sig. (2-tailed)	.000	.000	.000	.026					
G	Correlation	-.215**	-.132**	.074						
	Sig. (2-tailed)	.000	.000	.031						
H	Correlation	-.272**	-.017							
	Sig. (2-tailed)	.000	.626							
I	Correlation	.177**								
	Sig. (2-tailed)	.000								

A: ACT Composite; B:Age; C: High School GPA; D: On-Campus Housing; E: Cumulative GPA; F: Advising; G: Change of Major; H: Early Alert; I: Supplemental Instruction
Sig. (2-tailed)=Significance
**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

I: CORRELATION MATRIX YEAR ONE

Variable	B	C	D	E	F	G	H	I	J
Constant	-.001	-.118	-.231	-.040	-.255	-.265	-.284	-.061	-.036
A	.228	.128	-.409	.016	-.003	.248	.124	.009	-.074
B		.008	.127	-.165	.078	.012	-.251	-.079	.231
C			-.196	-.038	-.004	-.016	.093	.052	-.070
D				-.376	.077	.038	.015	-.036	-.041
E					.258	.041	.193	.097	.072
F						-.025	.075	-.014	-.006
G							-.048	.005	-.495
H								.047	.082
I									-.011

A- ACT Score; B-Ethnicity (White); C-Gender (Female); D-High School GPA; E-Cumulative GPA; F-Early Alert; G-Unmet Need; H-On-Campus Housing; I-Changed Major; J-Pell Eligible

J: CORRELATION MATRIX YEAR TWO

Variable	B	C	D	E	F	G	H	I	J	K	L	M	N
Constant	-.103	-.213	-.250	-.122	-.103	-.026	-.103	-.111	-.114	-.042	-.003	.070	-.404
A	.209	-.025	.017	-.354	.111	.048	.059	.261	-.004	.099	.019	-.178	.110
B		-.008	-.124	-.116	.229	.162	-.072	-.019	-.052	.214	.066	-.042	.028
C			-.012	.109	.018	-.109	.017	.038	-.019	.039	.003	-.118	.005
D				.042	.017	-.013	.037	-.029	-.004	-.001	.013	-.064	.055
E					.073	-.379	-.041	.063	.056	.011	-.052	-.106	.005
F						-.079	-.026	.492	.005	-.075	.011	-.144	.002
G							-.027	.043	.269	.156	.105	.018	.052
H								.010	-.088	.140	.130	.221	-.012
I									-.034	-.045	.026	-.112	-.038
J										.033	-.011	-.044	-.002
K											.080	.047	-.018
L												.040	-.018
M													-.052

A-ACT Score; B-Ethnicity (White); C-First Generation; D-Gender (Female); E-High School GPA; F-Pell Eligible; G-Cumulative GPA; H-Advising; I-Unmet Need; J-Early Alert; K-On-Campus Housing; L-Changed Major; M-Freshman Year Experience; N-Honors

K: CORRELATION MATRIX YEAR THREE

Variable	B	C	D	E	F	G	H	I	J	K	L	M	N
Constant	-.193	-.120	-.254	-.169	-.059	-.266	-.214	-.620	.060	.015	.043	.030	-.237
A	.196	-.119	-.380	.060	-.001	.086	.172	.244	-.172	-.022	.019	-.208	.026
B		-.008	-.068	-.077	.096	-.162	-.029	.053	-.222	-.032	-.107	-.068	.270
C			.210	.083	.080	-.082	.085	.033	.087	-.066	-.025	-.055	-.014
D				-.044	-.173	.176	.029	.021	.018	-.008	-.078	-.064	.060
E						-.170	.035	.035	-.122	.008	-.040	.116	.013
F						.220	.136	.032	-.189	-.118	-.147	-.143	.009
G							-.023	.001	-.101	-.011	.037	-.027	.054
H								-.036	.083	-.011	-.067	-.108	.426
I									.044	-.057	.018	-.078	.036
J										.026	-.092	.032	.088
K											.037	.021	-.068
L												.027	-.072
M													-.058

A-ACT Composite; B- Ethnicity (White) ;C- Gender (Female); D- High School GPA; E- Advising; F- Cumulative GPA; G- Early Alert ;H- Unmet Need; I- Honors ;J- On-Campus Housing; K- Changed Major; L- Supplemental Instruction; M- Freshman Year Experience; N- Pell Eligible

L: CORRELATION MATRIX YEAR FOUR

Variable	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Constant	-.195	-.013	-.16	-.046	-.374	-.132	.122	-.118	.077	-.382	.039	.013	-.23	-.153	-.056
A	.003	-.141	-.02	.098	-.021	.105	-.013	-.066	.012	.003	-.154	-.056	-.023	-.01	-.036
B		.073	.002	-.124	.156	-.099	-.128	.373	-.17	.138	.175	.074	-.126	-.087	-.093
C			.287	-.002	-.139	.049	-.119	.015	-.016	.065	.134	.039	.021	-.096	-.025
D				.271	-.59	.101	.015	.13	.063	.148	.109	-.233	.104	-.11	-.242
E					-.263	.081	.053	-.057	.248	.244	-.22	-.482	-.173	-.224	-.508
F						-.169	-.269	-.116	-.218	.088	-.04	.18	.208	.156	.276
G							-.058	.295	-.068	.096	.052	-.097	.091	-.096	-.004
H								-.055	.025	-.147	-.035	-.051	-.008	.076	-.127
I									-.076	.074	.414	-.03	.035	.051	-.044
J										.241	.139	-.299	-.142	-.117	-.104
K											-.048	-.017	-.095	.042	-.209
L												.048	-.139	-.111	.101
M													.22	-.018	.273
N														-.173	.096
O															.171

A-Age; B- Ethnicity; C-Gender; D-High School GPA; E-Cumulative GPA; F-ACT Composite; G-On-Campus Housing; H-Pell Eligible; I-Supplemental Instruction; J-Honors; K-Unmet Financial Need; L-Engagement; M-Engagement Courses; N-Early Alert; O-Advising; P-Change of Major

M: YEAR ONE TOLERANCE AND VARIANCE INFLATION

Variable	Tolerance	VIF
ACT Composite	.493	2.028
Advising	.881	1.136
Age	.957	1.045
Changed Major	.964	1.037
Cumulative GPA	.534	1.872
Early Alerts	.783	1.277
Ethnicity (White)	.791	1.264
First Generation	.958	1.044
Freshman Year Experience	.858	1.166
Gender (Female)	.919	1.089
High School GPA	.525	1.906
Honors Program	.795	1.258
On Campus Housing	.841	1.189
Pell Eligible	.627	1.596
Student Engagement	.990	1.010
Unmet Financial Need	.529	1.891

N: YEAR TWO TOLERANCE AND VARIANCE INFLATION

Variables	Tolerance	VIF
ACT Composite	.461	2.170
Advising Appointments	.850	1.177
Age	.970	1.031
Changed Major	.971	1.029
Cumulative GPA	.540	1.853
Early Alerts Issued	.633	1.579
Ethnicity (White)	.729	1.372
First Generation	.939	1.065
Freshman Year Experience	.864	1.158
High School GPA	.573	1.746
Honors Program	.771	1.297
On Campus Housing	.785	1.274
Pell Eligible	.658	1.520
Student Engagement	.900	1.111
Supplemental Instruction	.888	1.127
Unmet Financial Need	.565	1.769

O: YEAR THREE TOLERANCE AND VARIANCE

Variables	Tolerance	VIF
ACT Composite	.528	1.895
Advising Appointments Total	.810	1.234
Age	.964	1.038
Changed Major	.921	1.086
Cumulative GPA Spring 2011	.726	1.377
Early Alerts Issued Total	.615	1.626
Ethnicity (White)	.759	1.317
First Generation	.982	1.019
Freshman Year Experience	.913	1.095
Gender (Female)	.935	1.070
High School GPA	.576	1.735
On Campus Housing Total	.799	1.252
Pell Eligible	.841	1.189
Student Engagement Total	.797	1.254
Supplemental Instruction Total	.874	1.144

P: YEAR FOUR TOLERANCE AND VARIANCE

Variables	Tolerance	VIF
ACT Composite	.482	2.076
Advising Appointments Total	.800	1.250
Age	.963	1.039
Changed Major	.912	1.097
Cumulative GPA Spring 2011	.726	1.377
Early Alerts Issued Total	.615	1.627
Ethnicity (White)	.751	1.332
First Generation	.982	1.019
Freshman Year Experience	.889	1.125
Gender (Female)	.935	1.070
High School GPA	.576	1.735
Honors Program	.751	1.332
On Campus Housing Total	.797	1.255
Pell Eligible	.835	1.197
Student Engagement Total	.783	1.277
Supplemental Instruction Total	.874	1.144

Q: IRB APPROVAL FORM

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Institutional Review Board for Human Use

Form 4: IRB Approval Form
Identification and Certification of Research
Projects Involving Human Subjects

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The Assurance number is FWA00005960 and it expires on September 29, 2013. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56.

Principal Investigator: SYNCO, TRACEE M

Co-Investigator(s):

Protocol Number: **E110506003**

Protocol Title: *Background or Experience: Using Logistic regression to Predict College Retention*

The above project was reviewed on 5/31/11. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This project qualifies as an exemption as defined in 45CF46.101, paragraph 4.

This project received EXEMPT review.

IRB Approval Date: 5/31/11

Date IRB Approval Issued: 5/31/11

Sheila Moore, CIP

Sheila Moore, CIP
Director, Office of the Institutional
Review Board for Human Use (IRB)

Investigators please note:

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.

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