

**Development of a Binary Logistics Regression Prediction Model for First  
Year Student Persistence into the Second Year using Pre- and Post-  
Enrollment Variables in Private Liberal-Arts, Faith-Based, Midwest College.**

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## Abstract

The purpose of the current study was to identify the best combination of pre- and post-enrollment factors that best predict first year student persistence to their second year of college at the same institution. Furthermore, the purpose was to determine the successful prediction percentage for student persistence and to determine the odds ratio for the prediction model. The population of this study was new first year undergraduate students who enrolled at Avila University since the fall of 2009 with a sample limited to 815 students.

In this quantitative study, binary logistic regression models were developed using archival data to address the research questions. The dependent variable was persistence to the second year of college.

Results of the hypothesis testing found that a statistically significant correlation was found for each hypothesis question. The model included both pre- and post-enrollment variables, 1<sup>st</sup> term GPA and 2<sup>nd</sup> term credits earned were the two predictors that contributed significantly to the model. The Regression Model indicated that student were more likely to persistent to their second year of college the higher their 1<sup>st</sup> term GPA was and the more credits earned in the 2<sup>nd</sup> term. Models of significance were also found for pre-enrollment variables and post-enrollment variables, respectively.

Based on the findings, the researcher recommends that this study be repeated at colleges similar and dissimilar to Avila University to determine generalizability of the predictor model and incorporate other variables such as unmet financial need and measures of student resilience.

## **Dedication**

This dissertation is dedicated to my late father, Harland Ray Johnson. His love for others and life will always be a standard to which I live my life. In his remembrance, I offer the Serenity Prayer: “God grant us the serenity to accept the things we cannot change, to change the things we can, and the wisdom to know the difference.” Sobriety changed his life so he then dedicated his later years to serving those who struggle with addiction. From a user then as a substance abuse counselor, he understood first-hand the struggles of his friends (properly known as clients). Completing college changed my life, so today I dedicate my efforts to supporting those most likely not to succeed in college as I was that young man who had variables stacked against my pursuit of a college degree. This work is personal and allows me to show my dad that I appreciate all of his sacrifices that offered me the life I lead today.

Rest in Peace, Big H. I miss you.

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I am blessed to have worked alongside talented and dedicated professionals in my career, from those who are forced to put up with me on a daily basis to those I share great responsibility with as a leader of both the University of Saint Mary and Avila University. I would like to personally thank Dr. Bryan LeBeau and Sr. Diane Steele for their motivation to pursue a doctorate and Sr. Marie Joan Harris for her graceful motivation – you three all believed in my potential and for that I am deeply grateful. To Eva Williams, as you rest in peace know that you have impacted a life more than you ever knew.

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## Table of Contents

Abstract .....	ii
Dedication .....	iii
Acknowledgements .....	iv
Table of Contents .....	vi
List of Tables .....	ix
Chapter One: Introduction .....	1
Background .....	3
Statement of the Problem .....	5
Purpose Statement .....	6
Significance of the Study .....	6
Delimitations .....	7
Assumptions .....	8
Research Questions .....	8
Definition of Terms .....	9
Overview of the Methodology .....	11
Organization of the Study .....	11
Chapter Two: Review of the Literature .....	13
College Completion .....	13
Historic Review of Retention Research .....	17
Retention Research Results .....	25
Summary .....	30
Chapter Three: Methods .....	32
Research Design .....	32

Population and Sample .....	33
Sampling Procedures .....	33
Instrumentation .....	34
Measurement.....	35
Validity and Reliability.....	36
Data Collection Procedures.....	38
Data Analysis and Hypothesis Testing .....	40
Limitations .....	42
Summary.....	42
Chapter Four: Results .....	43
Descriptive Statistics.....	43
Hypothesis Testing.....	46
Summary.....	51
Chapter Five: Interpretation and Recommendations .....	53
Study Summary.....	53
Overview of the Problem .....	53
Purpose Statement and Research Questions .....	54
Review of the Methodology.....	55
Major Findings.....	55
Findings Related to the Literature.....	56

Conclusions.....	57
Implications for Action.....	57
Recommendations for Future Research.....	58
Concluding Remarks.....	59
References.....	60
Appendix (ces).....	66
Appendix A. IRB Application (Baker University).....	66
Appendix B. IRB Approval (Baker University).....	71
Appendix C. IRB Application (Avila University).....	73
Appendix D. IRB Approval (Avila University).....	81
Appendix E. Pre-Enrollment Logistical Regression Classification.....	83
Appendix F. Post-Enrollment Logistical Regression Classification.....	84
Appendix G. Pre-and Post-Enrollment Logistical Regression Classification.....	85

## List of Tables

Table 1. Net Financial Return or Loss to Taxpayers per Degree: Lifetime-Tax Payment Minus Taxpayer Subsidy .....	14
Table 2. Top Ten Most Effective Retention Strategies and Tactics by Institutional Type .....	21
Table 3. National First-to-second year Retention by Institutional Type & Admission Selectivity .....	23
Table 4. Retention Rates (2010)—First-time College Freshman Returning Their Second Year .....	24
Table 5. State of Missouri First year Retention Rate Trend .....	25
Table 6. Persistence Rate of Conditionally Admitted, Full-time, Degree-seeking Undergraduates from Term One to Term Two .....	27
Table 7. Persistence Rate from Term One to Term Two of First year, Full-time, Degree- seeking Undergraduates Who Took Two Developmental Courses .....	28
Table 8. Ratio of Credit Hours Completed to Attempted of First year, Full-time, Degree- seeking Undergraduates in First Term .....	29
Table 9. First-Time, Full-Time Student Cohort Data .....	33
Table 10. ACT’s College Readiness Benchmarks with Average ACT Scores.....	35
Table 11. Avila University’s Credit Hour and Grading System.....	37
Table 12. Categorical Variable Data Coding .....	40
Table 13. Continuous Variable Descriptive Statistics .....	44
Table 14. Continuous Post-Enrollment Variable Descriptive Statistics .....	44
Table 15. Categorical Pre-Enrollment Variable Frequency.....	45

Table 16. Categorical Post-Enrollment Variable Frequency .....	45
Table 17. Logistic Regression Analysis Model Coefficients and Test for Pre-Enrollment Variables .....	47
Table 18. Logistic Regression Analysis of Pre-Enrollment Variables Model Summary .....	47
Table 19. Logistic Regression Analysis of Pre-Enrollment Variables Step 2 .....	47
Table 20. Logistic Regression Analysis Model Coefficients and Test for Post-Enrollment Variables .....	49
Table 21. Logistic Regression Analysis of Post-Enrollment Variables Model Summary .....	49
Table 22. Logistic Regression Analysis of Post-Enrollment Variables Step 2.....	49
Table 23. Logistic Regression Analysis Model Coefficients and Test for Full Model .....	51
Table 24. Logistic Regression Analysis of All Variables Model Summary.....	51
Table 25. Logistic Regression Analysis of All Variables Step 2.....	51

## **Chapter One**

### **Introduction**

First year college student persistence has received national attention and is a focus at Avila University. It is evident through economic and societal advantages that earning a bachelor's degree has a lasting impact on the individual student, the college or university, and all levels of society. Furthermore, college-level learning is key to individual prosperity, to economic security, and to the enduring strength of the democracy (Lumina Foundation, 2012). On average, a person holding a bachelor's degree earns nearly twice as much as someone who holds only a high school diploma, resulting in the financial worth of obtaining a college degree equaling as much as one million dollars more over a lifetime (Carnevale, Cheah, & Rose, 2012).

The individual financial benefit of attaining a bachelor's degree has an effect on cities and state government agencies and their taxpayers. According to Klor de Alva and Schneider (2011), "On average, taxpayers subsidize bachelor's degrees in nearly all not-for-profit institutions at around \$8,000 per degree, and in public institutions the taxpayer investment is more than \$60,000 with return to the taxpayer ranging from \$17,000 to \$30,000" (p. 1). Nationally, the typical college graduate working full-time year-round paid 134% more in federal income taxes than those who earned a high school diploma but did not graduate from college (College Board, 2007).

In addition to the financial impact of bachelor's degree attainment, there is evidence of improved personal wellbeing. For example, according to the U.S. Department of Health and Human Services (2011), "Between 2007-2010, obesity among boys and girls 2-19 years of age decreased with increasing education of the head of

household” (p. 30). Also, persons with more than a high school education had the lowest percentage of cocaine use or street drugs (Brode et al., 2007). Furthermore, individuals who hold a bachelor’s degree are less likely to participate in social support programs, less likely to smoke, more likely to vote, and more likely to volunteer (College Board, 2007). Most importantly, on the average in 2006, 25-year-old men without a high school diploma had an average life expectancy of 9.3 years fewer than others with a bachelor’s degree or higher, and women had an expectancy of 8.6 years fewer (U.S. Department of Health and Human Services, 2011).

Given the lasting impact on the individual student at all levels of society are apparent; however, “college student departure poses a long-standing problem that attracts the interest of practitioners as they manage the enrollments of their college or university” (Braxton, Hirschy, & McClendon, 2004, p. 1). Academic difficulties, the inability to resolve individual educational and occupational goals, and failure to become or remain incorporated in the intellectual and social life of the institution influence student departure (Tinto, 1993).

Student retention research has historically offered insight to various issues attached to student persistence towards obtaining a college degree. According to Astin (1975), “the principle deficiency of published research on college student departure is the lack of longitudinal design and the use of only one or a limited number of institutions” (p. 3). In a contrasting way, Tinto (1993) advocates that there is benefit to a study focusing on one institution:

While it is true that such multi-institutional studies can be quite revealing of the aggregate patterns of departure, they are little use to either researcher or policy

planners concerned with the character and roots of student departure from specific institutions. (p. 38)

Research on college student retention is offered in literature and strongly supported by data; however, institutions exist in a particular context so detailed studies unique to an institution might provide the most relevant data to support reducing student departure (Hossler, 1991).

### **Background**

To achieve a bachelor's degree, students must successfully transition from high school through their first year of college, which presents challenges such as an increase in academic rigor and adapting socially to a new environment. In support of the student, certain variables can be evaluated to predict a successful transition from high school to college. For instance, high school academic achievement variables are strong predictors of retention (Reason, 2003). Eighty-seven percent of students who complete four years of math, science, and English in high school stay on track to graduate from college; those who do not complete that coursework persist in college at a 62% rate (Adelman, 1999; Warburton, Bugarin, & Nuñez, 2001). As a result, high school curriculum holds a strong influence over the academic preparedness of a college-bound student. In addition, "a student's academic performance measured by their college grade point average (GPA) is a major factor in college attrition" (Astin, 1975, p. 98). Therefore, it is necessary to introduce the input of academic preparation along with other challenges that might affect a first year college student persisting to the second year (Astin, 1993).

Avila University, a Catholic University sponsored by the Sisters of St. Joseph of Carondelet, is a liberal arts, values-based community of learning providing professional,

undergraduate, and graduate education to prepare students for responsible lifelong contributions to the global community. The mission and values of Avila University guide the efforts of the community to provide students a college experience that prepares them to be quality professionals and valuable members of their communities. Avila University values excellence in teaching and learning; the Catholic identity of the university; the sponsorship and contributions of the Sisters of St. Joseph; the worth, dignity, and potential of each human being; diversity and its expression; commitment to the continual growth of the whole person; and interaction with and service to others (Avila University, 2012). The deliberate caring and serving of the people without distinction is at the core of the institution and can be felt through the academic curriculum and co-curricular activities.

Located in Kansas City, Missouri, Avila University had a student population in fall 2013 of 1,971 students, of which 1,401 were undergraduates. Of the total enrollment, 67% were female; 61% were white, non-Hispanic; and 28% were Catholic. Furthermore, there were 1,124 full-time undergraduate students; 1,021 were enrolled as traditional full-time undergraduate students with 392 residing in university residence halls (Avila University, 2013).

The National Center for Education Statistics provides pre-enrollment data for the fall 2011 first year cohort at Avila University. The data show that 94% of first year students submitted ACT scores and 7% submitted SAT scores (U.S. Department of Education, 2013). The 2009, 2010, 2011, and 2012 first year student cohorts included in the current study have distinct measurements of persistence, GPA, and ACT composite scores.

## **Statement of the Problem**

Avila University's inconsistent year-to-year retention rate, swaying from 75% for the fall 2009 cohort to down to 65% for the fall 2010 cohort and then elevating up to 71% for the fall 2013 cohort, and its focus on increasing full-time undergraduate enrollment from 1,021 in the fall of 2013 to 1,200 in the fall of 2017 establishes that the study of persistence is critical in the management of full-time undergraduate enrollment. The problem is that Avila University does not understand the reasons for the inconsistent retention rates of its first year students. Learning more about variables that best predict student persistence might help offer an explanation for the inconsistent results the university is experiencing among first year students.

Scholars have shown that higher education is associated not only with occupational attainment, but also with other outcomes of interest such as health, happiness, sociopolitical attitudes, civic participation, cosmopolitanism, cultural taste, and social capital (Armstrong, Arum, & Stevens, 2008). Furthermore, there is substantial evidence to suggest individuals and society benefit from higher education. According to Hout (2012), "Conventional wisdom—imparted by parents, teachers, guidance counselors, and policy makers—reads these differences as evidence that young people would improve their lives by staying in high school, graduating, going on to college, and earning a degree" (p. 380).

A college-educated workforce is critical in the United States of America to remain competitive in the global marketplace (Tinto, 2012). Although there are many efforts to increase student access to college, "what matters is not simply attending college but completing a degree, especially a four-year degree" (Tinto, 2012, p. 1). An estimated

50% of college students will leave higher education prior to graduation, and these high departure rates negatively affect the stability of institutional enrollments, budgets, and the public's perception of the quality of colleges and universities (Braxton et al., 2004). Additionally, the positive return on investing in education is diminished.

### **Purpose Statement**

The purpose of the current study was to identify the best combination of pre- and post-enrollment factors that best predict first year student persistence to their second year of college at the same institution. Furthermore, the purpose was to determine the successful prediction percentage for student persistence and to determine the odds ratio for the prediction model. The pre-enrollment variables were cumulative high school GPA, ACT composite score, number of college credits earned in high school, month of registration, type of admission offered, and gender. The post-enrollment variables were enrollment in a developmental math course, first-semester GPA, second-semester GPA, number of credits attempted in the first semester, number of hours earned in the first semester, number of credits attempted in the second semester, number of hours earned in the second semester, and residence status.

### **Significance of the Study**

Improved college student retention benefits a variety of constituents. This study is significant as it will provide Avila University the retention data necessary to inform decisions on policy and programs that are intended to improve first year student persistence. Also, the results of this study will be used to better predict first year student retention and adapt current recruitment and advising actions to address the findings. The increased understanding will enhance the learning community and, in turn, provide

practical use by guiding the university enrollment management plan to ensure that more students who enroll at Avila University persist to their second year of college.

### **Delimitations**

The following delimiters are provided to offer “self-imposed boundaries set by the researcher on the purpose and scope of the study” (Lunenburg & Irby, 2008, p. 134):

1. This study was focused on the new full-time first year cohorts who entered the university in the fall of 2010, 2011, 2012, and 2013.
2. This study does not include new transfer students who had fewer than 24 credit hours from previous coursework, and who are often categorized as first year students, were excluded from this study.
3. This study was focused on pre-enrollment variables including students’ cumulative high school GPA, ACT composite score, number of college credits earned during high school, type of admission offered, month of registration, and gender. Other pre-enrollment variables exist that were not included in this study.
4. This study was focused on post-enrollment variables including first and second semester GPA, credits taken and credits earned in the first and second semesters, residential status, and enrollment in developmental math or English courses. Other post-enrollment variables exist that were not included in this study.
5. This study was conducted at a value-based, Catholic, liberal arts university. The results of this study potentially cannot be generalized to other post-secondary institutions.

## **Assumptions**

“Assumptions are postulates, premises, and propositions that are accepted as operational for purposes of research” (Lunenburg & Irby, 2008, p. 135). For this study, the following assumptions were made:

1. It was assumed that students who enrolled as first year students had full intentions of matriculating to their second year and ultimately graduating from the university.
2. It was assumed based on the institution’s criteria for admission that students included in this study were believed to be capable of achieving collegiate academic and social success in order to be retained.
3. It was assumed that high school GPAs hold common standards of achievement within each participant’s secondary school.
4. It was assumed that the ACT/SAT tests were administered appropriately and consistently and that the scores were calculated and recorded accurately.

## **Research Questions**

Three research questions were used to shape this study to align with the purpose of identifying indicators that best predict first year student persistence to their second year of college at the same institution. The following questions focus the research to look at specific data and were used for this study:

RQ1. What combination of pre-enrollment variables (cumulative high school GPA, ACT composite score, number of college credits earned in high school, month of registration, type of admission offered, and gender) best predicts student persistence?

RQ2. What combination of post-enrollment variables (enrollment in a developmental math course, first-semester GPA, second-semester GPA, number of credits attempted in the first semester, number of hours earned in the first semester, number of credits attempted in the second semester, number of hours earned in the second semester, and residence status) best predicts student persistence?

RQ3. What combination of pre- and post-enrollment variables best predicts student persistence?

### **Definition of Terms**

For the purpose of clarity, the following key terms of this study are defined.

**ACT composite score.** An ACT composite score has a range of 1 to 36. The composite score is the average of the four test scores (English, mathematics, reading, and science) earned during a single test administration, rounded to the nearest whole number (ACT, 2009).

**Admission status.** The admission status is determined by the Office of Undergraduate Admission upon receiving the required application materials (Avila University, 2012). There are two types of admission status:

**Regular admission.** Regular-admitted students meet minimum admission criteria set by faculty. In general, the minimum criteria is as follows:

1. High school grade point average of 2.5 or above (4.0 scale); recommended 16 units of college preparatory coursework as reflected in the high school transcript; and

2. ACT score of 20 or above or SAT score of 930 or above (Avila University, 2012).

***Provisional admission.*** Provisional-admitted students may be required to participate in a university skills training program designed to develop academic and college organizational skills. Additionally, provisional-admitted students may be restricted in the number of credit hours for which they may enroll in their first semester (Avila University, 2012).

**Cumulative grade point average (GPA).** The cumulative GPA is obtained by dividing the total number of grade points earned by the total number of semester hours earned during the student's high school career (Avila University, 2012).

**First year student.** A first year student is a student who has graduated high school (or its equivalence) and is entering the first year of college without enrolling in college courses post-high school graduation. Students must be degree-seeking (Avila University, 2012).

**Full-time student.** A full-time student is enrolled in 12 to 18 undergraduate credit hours per semester (Avila University, 2012).

**Persistence.** Persistence is the rate at which students who begin higher education at a given point in time continue in higher education (Tinto, 2012).

**Traditional undergraduate student.** A traditional undergraduate student is enrolled in courses primarily held during the day at Avila University (Avila University, 2012).

## **Overview of the Methodology**

This was a binary logistics regression study using both categorical and continuous numeric data gathered on first year college students enrolled full-time at a private, faith-based, liberal arts university. The participants were from 2010, 2011, 2012, and 2013 cohorts. The data were selected by purposive means. Binary logistics regression models were developed using archival data to address the research questions to identify the independent variable combination that comprised the most parsimonious model for predicting the dependent variable.

## **Organization of the Study**

The purpose of this study was to identify indicators that best predict student persistence to their second year of college at one particular institution. The study is presented in five chapters. Chapter one included the introduction and rationale of the study, background, statement of the problem, purpose statement, significance of the study, delimitations, assumptions, research questions, definition of terms, and the methodology overview.

Provided in chapter two is a comprehensive review of the literature on the topic of post-secondary student retention. More specifically, a summary of practical and theoretical findings of related retention studies is provided along with an overview of ACT retention data. In chapter three the methodology of the study is expanded to include a description of the research design, population and sample, sampling procedure, instrumentation and measurement, data collection procedures, data analysis and hypothesis testing, and limitations of the study.

Chapter four includes the findings of the study. In chapter five, the interpretation and recommendations through discussion of the results tied to the literature and a conclusion with implications for action and recommendations for future research are described.

## **Chapter Two**

### **Review of the Literature**

College student retention from the first year to the second year continues to be an area of focus for post-secondary institutions as that rate of persistence has been connected with federal expectations and a national understanding of student success. As a result, the need to study first year college student retention is important to the landscape of colleges and universities across the United States. The purpose of this literature review was to investigate the immense amount of research focusing on college student retention along with recommended strategies and tactics that best support student persistence.

#### **College Completion**

According to Georgetown University Center on Education and the Workforce (Carnevale, Cheah & Jayasundera, 2012), 60% of U.S. jobs will require some form of post-secondary education by 2018. Accordingly, a bachelor's degree pays a handsome net financial reward in comparison to a high school diploma—a reward that over a lifetime can range, on average, from a net present value in 2010 dollars of more than \$230,000, at non-/less selective secondary institutions (Klor de Alva & Schneider, 2011). In fact, census data from the American Community Survey demonstrates that educational attainment is by far the most important social characteristic for predicting earnings and, specifically, individuals who attain a bachelor's degree earn \$790,000 more over a lifetime than those who had only some college (Julian & Kominski, 2011). Furthermore, Nexus Research and Policy Center and American Institutes for Research (Klor de Alva & Schneider, 2011) focuses on the economic returns and costs of a bachelor's degree.

On average, taxpayers subsidize bachelor's degrees in nearly all not-for-profit institutions at \$8,000 per degree, and in public institutions, the taxpayer investment is more than \$60,000 (Klor de Alva & Schneider, 2011). Overall, taxpayers derive substantial benefits from higher wages bachelor's graduates earn in comparison to high school graduate. During the first decade of work by bachelor's graduates, the return to the taxpayer ranges between \$17,000 and \$30,000 depending on the competitiveness of the institution (Klor de Alva & Schneider, 2011). From a taxpayer's perspective, the return on investment is substantial regardless of the type of post-secondary institution awarding bachelor's degrees. Table 1 provides details on net financial return or loss to taxpayers based on institutional type:

Table 1

*Net Financial Return or Loss to Taxpayers per Degree: Lifetime-Tax Payments Minus Taxpayer Subsidy*

Barron's Rating	For-Profit	Public	Not-for-Profit
Non/Less Competitive	\$60,948	(\$7,485)	\$44,143
Competitive	N/A	\$4,113	\$49,537
Very Competitive	N/A	\$16,944	\$69,988
Most Competitive	N/A	(\$9,278)	\$88,402
Highly Competitive	N/A	\$22,816	\$84,759

*Note:* From "Who Wins? Who Pays? The Economic Returns and Costs of a Bachelor's Degree" (Klor de Alva & Schneider, 2011)

In addition, return on taxpayer investment per bachelor's degree graduate is most substantial with the not-for-profit institutions, regardless of the competitiveness of the institution.

A bachelor's degree not only offers economic advantages for the individual who obtained it but also for the individual's city and state government agencies. Furthermore, the typical college graduate working full-time, year-round paid 134% more in federal income taxes and almost 80% more in total federal, state, and local taxes than the typical high school graduate (College Board, 2007). The median earnings of full-time, year-round workers age 25 and older with a bachelor's degree is \$50,900, with \$11,900 in tax payments. Comparatively, high school graduates on average earn \$31,500 with \$6,600 in tax payment (College Board, 2007). Specifically, a worker with a bachelor's degree will earn \$1 million more than someone with a high school diploma and no college experience (Carnevale, Cheah, & Rose, 2012). Only 14.3% of high school graduates earn more than the median bachelor's degree holder (Carnevale, Cheah, & Rose, 2012). Obtaining a post-secondary credential is usually worth the effort, as evidenced by higher earnings over a lifetime (Carnevale, Cheah, & Rose, 2012).

Another factor for consideration is the correlation of life expectancy and degree attainment. In 2011, the U.S. Department of Health and Human Services, comparing life expectancy by educational degree of attainment, found that the gap in life expectancy at age 25, by education, widened between 1996 and 2006 for both men and women with a bachelor's degree or higher (p. 37). Moreover, children and adolescents living in households where the head of household has a college degree are less likely to be obese compared with those living in households where the household head has less education

(Carroll, Flegal, Lamb, & Ogden, 2010). Also, persons with more than a high school education had the lowest percentage of ever used and past use of cocaine or street drugs (Brode, Fryar, Hirsch, Porter, Kottiri, & Louis, 2007). Subsequently, The College Board (2007) reinforced the value to the bachelor's degree by providing facts on aspects of life, specifically regarding health insurance, unemployment, poverty, public assistance program usage, behaviors of smoking and exercise, voting, and volunteerism. The following are key concepts from The College Board (2007) findings:

- The proportion of college graduates receiving health insurance in 2005 was 16 percentage points higher than the percentage of high school graduates receiving these benefits (p. 16).
- Unemployment rates are much lower for college graduates than for high school graduates and the 3.6% poverty rate in 2005 for bachelor's degree recipients was about one-third of the 10.8% poverty rate for high school graduates (p.18).
- Individuals with higher levels of education are less likely than others to live in households that participate in social support programs (p. 20).
- Smoking rates among college graduates have been significantly lower than smoking rates among other adults since information about the risks became public (p. 21). In addition, individuals with higher levels of education are more likely to engage in exercise than those with lower levels of education (p. 23).
- Adults with higher levels of education are more likely than others to be open to differing opinions and are more likely to vote (p. 27).

- In 2006, volunteer rate was 43% among college graduates, over twice the 19% of high school graduates. Additionally, the median number of volunteer hours increased with educational attainment (p.25).

Earning a college degree not only contributes more to the tax base and by having a greater ability to participate in the local economies; individuals with college degrees place less of a burden on the social services support network and the cost associated with it. In view of these findings, in order to achieve a bachelor's degree, students must navigate their first year of college academically and socially.

High school achievement variables are strong predictors of retention (Reason, 2003). Concurrently, academic variables achieved during the first year of college are strong predictors of retention. As an estimate, 50% of college students will leave higher education (Braxton, Hirschy & McClendon, 2004) with 75% of such students leaving within their first two years of college (Tinto, 1987). Improving first year college student retention provides a positive return on investment for the student, institution, and economy. In contrast, high departure rates negatively affect the stability of institutional enrollments, budgets, and the public's perception of the quality of colleges and universities (Braxton, Hirschy & McClendon, 2004).

### **Historical Review of Retention Research**

College student persistence research dates as far back as 1938 when the U.S. Department of Interior and the Office of Education published a study led by John McNeely. This research focused on the reason for departure, personal characteristics, and social engagement. William Spady (1970) provided the first widely recognized model in retention study and in the following year published research that suggested

student attrition was linked to both formal and informal academic experience and social integration.

These studies led to the emergence of Vincent Tinto's research on student departure. Tinto's (1975) model of student integration, which was based in part on Durkheim's suicide model, suggested that student attrition was linked to both formal and informal academic experiences as well as social integration. Tinto's (1975) model proposes that the degree of success students have influenced their level of commitment to an institution, academic goals, and career goals.

Other student departure theories attempt to explain the rates of attrition from the first year of college to students' second year. Specifically, student departure research is critical to the individual prospective college student, the professional enrollment practitioner, and society. Theories from a variety of disciplines have accrued on the topic of student departure and student success.

In particular, psychosocial theories view individual development as the accomplishment of a series of developmental tasks (Pascarella & Terenzini, 2005, p. 20). These theories suggest possible vectors of college student development, explained as "major highways for journeying toward individualization—the discovery and refinement of one's unique way of being—and also toward communion with other individuals and groups, including the larger national and global society" (Chickering, 1969, p.35).

A deviation from psychosocial theories and sociological perspectives offers research on the influence the environment has on college student departure. For example, Astin (1993) provides the I-E-O model, which makes clear temporal distinctions between input, environmental, and outcome variables; in other words, the student input

characteristics are assessed prior to any exposure to the college environment, while the college environment is assumed to intervene between input and outcome (p. 80). Related to the input aspect of Astin's model, the Interactionalist Theory explains that students enter college with various unique characteristics regarding family background and previous school experiences (Tinto, 1975). Similar to the underlying forces of Astin's I-E-O model, but offering more specific environmental reasons to college student departure, Tinto (1993) argues that student departure arises out of a process of interaction between an individual and other members of the academic and social system of an institution.

Recent research suggests actions that have a positive impact on student success. For instance, Swail (2004) offers the "Geometric Model of Student Persistence and Achievement which provides a method for discussion and focus on the cognitive and social attributes that students bring to campus; and the institutional role in the student experience. The student is placed at the center of this model," (p. 13). Post-secondary administrators can use this model by proactively supporting student persistence and achievement (Swail, 2004). To that end, the balance of cognitive, social, and institutional factors will all influence a first year college student and the efforts to keep the balance of those factors centered within the model.

Conversely, Tinto (2012) challenges his previously published student attrition research by focusing on the correlation between why students leave and the reasons college students persist. Historically, student success "research has also tended to focus on theoretically appealing concepts that do not easily translate into definable courses of action," (Tinto, 2012, p. 5). Student success efforts need to move from theory to practice.

According to Tinto (2012), “Students are more likely to succeed in settings that establish clear and high expectations for their success, provide academic and social support, frequently assess and provide feedback about their performance, and actively involve them with others on campus, especially in the classroom,” (p. 8). These general practices provide institutions a guide to best influence student persistence. To fully utilize theory and the research-based model focusing on student retention, practitioners use specific strategies and tactics to prevent student departure. As provided in Table 2, Noel-Levitz, Inc. (2012), based on their research and consulting experiences, provides the most effective retention strategies and tactics being used in higher education to best support student persistence:

Table 2

*Top 10 Most Effective Retention Strategies and Tactics by Institution Type*

Rank	Four-Year Private	Four-Year Public
1	Academic support program or services	Honors programs for academically advanced students
2	Programs designed specifically for first year students	Programs designed specifically for first year students
3	Practical work experiences provided in students' intended major to apply their learning	Academic support programs or services
4	Honors programs for academically advanced students	Supplementary instruction
5	Tutoring	Learning Communities
6	Advising by professional staff, one-on-one	Mandatory advising by professional staff, one-on-one
7	Mandatory advising by professional staff, one-on-one	Practical work experiences provided in students' intended major to apply their learning
8	Early-alert and intervention system	Tutoring
9	Advising especially for students approaching graduation to ensure they are on track	Programs designed specifically for students who are at risk academically
10	Programs designed specifically for students who are at risk academically	Programs designed specifically for international students

*Note.* Adapted from “2013 Student Retention and College Completion Practices Report,” by Noel-Levitz, 2013, p. 3.

The research by Noel-Levitz, Inc. (2013) further suggests “academic support programs, honors programs, and first year student programs emerged as the top-ranked, most effective strategies and tactics across higher education” (p. 1). Specifically,

improved student retention is the “result of intentional, structured, and proactive actions and policies directed toward the success of all students” (Tinto, 2012, p. 117). Within the most effective strategies for four-year private institutions is early alert and intervention. With an early-alert program, both pre-enrollment and post-enrollment variables might be used as examined in this study.

Over the past 20 years, colleges and universities, as well as foundations, state governments and, more recently, federal governments, have invested considerable resources in the development and implementation of a range of retention programs (Tinto, 2012.). According to ACT, Inc. (2014), the national average first-to-second-year retention for all types of institutions is 67.6 (p. 3). Categorized by type of post-secondary institution, Table 3 provides details on the number of participating institutions and the percentage rate of the data. Also presented in Table 3, ACT, Inc. provides the data on institutional type, segmented by level of selectivity.

Table 3

*National First-to-second Year Retention by Institutional Type & Admission Selectivity*

Institutional Type	All Admission Selectivity Mean (%)	Traditional Admission Selectivity Mean (%)
Two-year Public	54.9	49.4
Two-year Private	64.3	69.6
Bachelor's Public	64.2	68.7
Bachelor's Private	69.8	65.2
Bachelor's and Master's Public	68.4	69.0
Bachelor's and Master's Private	73.2	69.9
Bachelor's, Master's, and Doctoral Public	77.9	73.4
Bachelor's, Master's, and Doctoral Private	80.9	73.5
Total (All Types)	67.6	N/A

*Note.* Adapted from “Condition of College & Career Readiness,” by ACT, 2014b, p. 3.

Although the data is similar, The National Center for Higher Education Management Systems (NCHEMS) provides greater insight pulling from a national database of all post-secondary institutions across the United States. Furthermore, NCHEMS provides data, (presented within Table 4) by state, in close proximity to Missouri.

Table 4

*Retention Rates (2010)—First-time College Freshman Returning Their Second Year*

Area/State	Total Retention Rate (%)	Full-Time Retention Rate (%)
Nation	54.3	60.8
Missouri	54.7	59.5
Kansas	52.6	57.9
Nebraska	59.6	64.0
Iowa	50.0	55.1
Oklahoma	50.6	55.5
Arkansas	53.0	57.1

*Note.* Adapted from “Retention Rates—First-Time College Freshman Returning Their Second Year,” by NCHEMS Information Center, 2010. Retrieved from <http://www.higheredinfo.org/dbrowser/?level=nation&mode=data&state=0&submeasure=228>

The comparison by state shows that there is a first year student retention rate discrepancy within a region. As can be seen in Table 9, Avila had a retention rate of has exceeded the nation and included states in Table 4. The student behavior and retention practices might be similar across a region, with the retention result of college first year students returning to school their second year varying by state. The first year college student retention trend in Missouri is presented in Table 5.

Table 5

*State of Missouri First year Retention Rate Trend*

Area	Year 2007	Year 2008	Year 2009	Year 2010
Nation	53.0	53.5	52.6	54.3
Missouri	55.0	57.2	55.7	54.7

*Note.* Adapted from “Retention Rates – First-Time College Freshman Returning Their Second Year,” by NCHEMS Information Center, 2010. Retrieved from <http://www.higheredinfo.org/dbrowser/?level=nation&mode=data&state=0&submeasure=228>

Comparing Missouri’s first year retention rate trend to the national trend, Missouri is consistently achieving higher rates. As the national rate improved in 2010, it was comparable to Missouri’s rate. Avila University consistently has had a higher retention rate than both the national and state of Missouri average.

National, regional, and state of Missouri retention data provide the framework to understand the importance of this research. Moving from data to research provides the background and theoretical approaches used to improve retention rates.

## **Retention Research Results**

### **Pre-Enrollment Variables.**

Prior to a student’s first year in college, variables are available to predict a student’s academic success in college. Research on pre-enrollment variables will be provided in this section.

A student’s past academic record and ability is the greatest predictor of college student persistence through college (Astin, 1975). As high school grades decrease, the chance of students being successful in college also decreases (Astin, 1975). Although there is a variety of ways to look at academic record and ability, “hundreds of studies

using various measurements and methodologies have yielded strikingly similar results: college grade point average can be predicted with modest accuracy (multiple correlation around .55) from admission information. The two most potent predictors are the student's high school GPA and scores on a college admissions tests" (Astin, 1993, p. 187). One of the major college admission tests is ACT.

Further, 28% of ACT-tested high school graduates met none of the ACT College Readiness Benchmarks which comprise of English composition, college algebra, social sciences and biology, compared to 25% who met all four (ACT, 2011b). These benchmarks are the minimum ACT test scores required for a student to have a high probability of success in first year, credit-bearing college courses (ACT, 2007, p. 24).

A second variable to consider is the type of admission a student is offered upon entering a post-secondary institution. Although criteria are not consistent across colleges and universities, generally schools place conditions on students who fall below the typical standards of regular admission. Astin (1975) suggests that "perhaps most important in terms of setting admissions policy is the finding that the ability to predict dropping out is still extremely limited" and that when "considering changes in admission policy, institutions should keep in mind that a number of environmental circumstances can also influence attrition rates" (p. 51). Table 6 provides detailed persistent rates of full-time students who were conditionally admitted to the institution.

Table 6

*Persistence Rate of Conditionally Admitted, Full-time, Degree-seeking Undergraduates from Term One to Term Two*

	All Four-year Private Participating Institutions (%)	Four-year Private Institutions with Lower Selectivity (%)	Four-year Private Participating Institutions with Higher Selectivity (%)
25 <sup>th</sup> percentile	75.0	66.0	76.5
Medium	84.0	81.0	84.5
75 <sup>th</sup> percentile	88.5	89.0	88.0

*Note.* Adapted from “2015 Student Retention Indicators Benchmark Report,” by Noel-Levitz, Inc., 2015, p. 4.

This information suggests that admitting selectivity of the institution influences the persistence rate of students who were admitted conditionally.

Research on college student gender has various results in terms of its influence on academic performance and persistence (Astin, 1975; Tinto, 1987; Reason, 2003). In particular, males tend to have a lower grade point average and a greater probability of academic warning (DeBerard, M., Spielmans, G., & Julka, D., 2004). This factor might explain why more women than men who enter higher education eventually graduate from college. Nonetheless, gender as a variable provides gender characteristic information that is useful in student success research.

### Post-Enrollment Variables.

Once students begin their first year of college coursework, variables become available to evaluate. Research on post-enrollment variables will be provided in this section.

One variable includes Students who graduate from high school but are underprepared for college course work. One of the consequences of students entering college underprepared is that the student is required to take remedial courses. According to The College Board (2011), “As of 2008, 37.6% of first and second-year undergraduates in the United States are in remedial courses after high school graduation” (p.119). Table 7 provides the implication on student persistence when students are enrolled in remedial coursework showing that students who take two developmental courses had a medium persistence rate of 20%, meaning 2 out of 10 students persisted from term one to term two.

Table 7

*Persistence Rate from Term One to Term Two of First year, Full-time, Degree-seeking Undergraduates Who Took Two Developmental Courses*

	All Four-year Private Participating Institutions (%)	Four-year Private Institutions with Lower Selectivity (%)	Four-year Private Participating Institutions with Higher Selectivity (%)
25 <sup>th</sup> percentile	7.3	7.5	7.5
Medium	20.0	19.0	20.5
75 <sup>th</sup> percentile	33.8	41.0	28.8

*Note.* Adapted from “2015 Student Retention Indicators Benchmark Report,” by Noel-Levitz, Inc., 2015, p. 7.

Other academic variables, such as grade point average and course completion are strong indicators of first year success and likely to influence decisions to return for the sophomore year. Considering both remedial and non-remedial coursework, the student's grade point average provides unique insight to predicting persistence as "academic performance is a major factor in college attrition for both men and women" (Astin, A., 1975, p. 98.). In addition to and reflected in the grade point average, the course completion should be evaluated to predict student persistence. Table 8 provides the ratio of courses completed by first year students for four-year private institutions based on the level of selectivity.

Table 8

*Ratio of Credit Hours Completed to Attempted of First year, Full-time, Degree-seeking Undergraduates in First Term.*

	All Four-year Private Participating Institutions (%)	Four-year Private Institutions with Lower Selectivity (%)	Four-year Private Participating Institutions with Higher Selectivity (%)
25 <sup>th</sup> percentile	90.0	86.0	92.0
Medium	93.0	92.0	94.0
75 <sup>th</sup> percentile	95.0	94.0	96.0

*Note.* Adapted from "2015 Student Retention Indicators Benchmark Report," by Noel-Levitz, Inc., 2015, p. 10.

The majority of courses taken by first year, full-time undergraduate students are completed based on the ratio figures.

Finally, identifying where students reside during college influences their persistence rate. Students residing in university provided residence halls have a higher level of co-curricular involvement that takes place outside of the classroom (Astin, 1977; Chickering, 1975). Furthermore, residential students are retained at a greater rate than students who do not reside on campus (Astin, 1977; Tinto, 1993). In addition, the satisfaction of commuter students regarding the institution's academic climate and their beliefs on whether or not people who go to college are better prepared for life are both significant indicators of student persistence (Johnson, J., 1997).

### **Summary**

Research has conveyed theoretical approaches and analytical data to explain the student departure phenomenon. The breadth and depth of published research fluctuate by variables; however, the research on predicting student departure is plentiful and ongoing.

### **Chapter Summary**

This chapter showed breadth and depth of college student persistence research published over time. Astin (1975) argued that the principle deficiency of published research is the lack of longitudinal design and the use of only one or a limited number of institutions (p. 3). In contrast, Tinto (1993) disagrees, stating that “while it is true that such multi-institutional studies can be quite revealing of the aggregate patterns of departure, they are little use to either the researcher or policy planners concerned with the character and roots of student departure from specific institutions (p. 38). There continues to be a focus on this subject matter in research and practice. Chapter Three presents the current study's research design, population, sample, sampling procedure, and

data collection procedures. In addition, Chapter Three presents data analysis, hypothesis testing, and limitation of this study.

## **Chapter Three**

### **Methods**

This study was focused on pre- and post-enrollment variables that may predict persistence to first year students' second year of college. Specific student data were collected to be analyzed and interpreted pertaining to student persistence. The research design section contains information on the variables used in the study by assigning them to two groups: pre-enrollment variables and post-enrollment variables. The population, sample, and sampling procedure are described. Within the instrumentation section, the measurement, validity, and reliability of the ACT assessment and GPA are described. An explanation of the process used to collect the data, the data analysis and hypothesis testing, as well as limitations to the study, are provided.

### **Research Design**

The regression model predicts a categorical dependent variable from a set of predictor independent variables (Fidell & Tabachnick, 2007). The dependent variable was persistence to the second year of college. The pre-enrollment independent variables were cumulative high school GPA (on a 4.0 scale), ACT composite score, number of college credits earned in high school, month of registration, type of admission offered (regular, provisional, or restricted provisional), and gender. The post-enrollment independent variables were enrollment in a developmental math course, first-semester GPA, second-semester GPA, number of credit hours attempted in the first semester, number of credit hours attempted in the second semester, number of credit hours earned in the first semester, number of credit hours earned in the second semester, and residential status (on-campus or off-campus).

## Population and Sample

The population of this study was new first year undergraduate students who enrolled at Avila University since the fall of 2009. The sample selected was comprised of five first-time, full-time student cohorts who were entering their fall semester of college from 2009 until 2013. Table 9 contains a general profile of the first year cohorts included in this study.

Table 9

### *First-Time, Full-Time Student Cohort Data*

Characteristic	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013
Total Cohort	118	167	138	210	182
Mean ACT*	22.62	22.57	22.20	22.70	21.95
Mean GPA	3.35	3.26	3.24	3.29	3.23
Fall-to-Spring Retention %	92	89	92	88	89
Fall-to-Fall Retention %	75	65	66	70	71

\* ACT Composite Score.

The sample included 815 first year college students enrolled full-time at Avila University.

## Sampling Procedures

Students were selected for this study by purposive means, as they were chosen based on their enrollment status at Avila University. Purposive sampling involves selecting a sample centered on characteristics of people in the sample (Jones & Kottler,

2006; Lunenburg & Irby, 2008). All students ( $n = 815$ ) who enrolled full-time as first year students at Avila University were included in this study; however, 97.2% ( $n = 792$ ) were used in data set for analysis.

### **Instrumentation**

ACT is one measurement used in the study. The ACT test is used to measure how well a student is academically prepared to handle college-level academic rigor (ACT, Inc., 2007). The best way to predict success in college is to measure as directly as possible the degree to which each student has developed the academic skills and knowledge that are important for success in college (ACT, Inc., 2007). Accordingly, Avila University requires their first year applicants to submit their official ACT or SAT scores, with a majority submitting ACT, which contains four multiple-choice tests (English, mathematics, reading, and science) and an optional writing test, which are all designed to measure skills that are most important for success in post-secondary education and which are acquired in secondary education (ACT, Inc., 2007).

The average ACT composite score has remained nearly constant between 2007 and 2011 (ACT, Inc., 2011b). Specifically, in terms of sub-scores, English represents the lowest average score with reading dropping at the most dramatic rate over the 5-year time period while math has improved from 21.0 to 21.1 between 2007 and 2011 (ACT, Inc., 2011b). Considering ACT's College Readiness Benchmarks, the numbers are not supportive of quality academic preparation to ensure college readiness and, in time, student success. Table 10 contains details on ACT's college readiness benchmarks by college course.

Table 10

*ACT's College Readiness Benchmarks with Average ACT Scores*

College Course	Subject Area Test	ACT Benchmark	Average ACT Scores
English Composition	English	18	20.6
Social Sciences	Reading	21	21.3
College Algebra	Mathematics	22	21.1
Biology	Science	24	20.9

*Note.* Adapted from “Condition of College & Career Readiness,” by ACT, 2011b, p. 16.

A curriculum-based test, ACT measures what students are able to do with what they have learned in school, not abstract qualities such as intelligence or aptitude (ACT, Inc., 2007, p. 1). Furthermore, the majority of the test exercises focus on complex problem-solving and only a few for narrow skills (ACT, Inc., 2007). Numerous times, a student may take the ACT at one of the physical locations and on the dates approved by ACT, Incorporated.

**Measurement.** The ACT functions as a stand-alone program typically taken when a student is in eleventh or twelfth grade and measures a student’s academic readiness for college in key content areas:

For each of the four multiple-choice tests (English, mathematics, reading, and science), the raw score (number of correct responses) are converted to scale scores from 1 to 36. The Composite score is the average of the four scale scores rounded to the nearest whole number (fractions of 0.5 or greater round up).

(ACT, Inc., 2007, p. 16)

**Validity and reliability.** According to Lunenburg and Irby (2008), “Validity is the degree to which an instrument measures what it purports to measure” (p. 181) and “reliability is the degree to which an instrument consistently measures whatever it is measuring” (p. 182). Many institutions use the ACT data to determine academic preparedness for college; therefore, consistencies of these scores are important as institutions make a determination of acceptance. To ensure consistency, there is an ongoing assessment of the content of the ACT test during the development process to ensure the test is measuring what it should be measuring, with each item being examined at a minimum of 16 times (ACT, Inc., 2007). Furthermore, “detailed test specifications have been developed to ensure that the test content is representative of the current high school and university curricula” (ACT, Inc., 2007, p. 74). Reliability coefficients are estimates of test score’s consistency that range from zero to one with values near one indicating greater consistency. In 2005-2006 school years, approximately 2,000 ACT test-takers offered a reliability coefficient medium score of .77, with a minimum of .76 and maximum of .78. To ensure consistency of the ACT test:

Care is taken to ensure that the basic structure of the ACT tests remains the same from year to year so that the scale scores are comparable, the specific characteristics of the test items are used in each specification category are reviewed regularly. (ACT, Inc., 2007, p. 7)

## **GPA**

GPA is also a measurement used in this study. Each participant’s final high school GPA was included in this data set for this study and serves as a measure of

academic performance assessment. Additionally, participants' college GPAs were included for the first and second semester of college.

Non-weighted cumulative GPA is the average of all final course grades received in secondary school level courses based on a 4.0 scale. A non-weighted grade point average is calculated by multiplying the final course grade with the credit awarded divided by the total credits. To calculate GPA, the total number of grade points is divided by the total number of semester hours (Avila University, 2014). Table 11 contains the details on the points associated with each earned grade.

Table 11

*Avila University's Credit Hour and Grading System*

Grades	Meaning	Points per Credit Hour
A	Superior	4
B	Above Average	3
C	Average	2
D	Below Average	1
F	Failing	0

*Note.* Adapted from "2014-15 Undergraduate Academic Catalog," by Avila University, 2014, p. 37.

For high school GPA, Avila University requires that all official transcripts be sent directly to the Office of Undergraduate Admission from a professional staff member of the secondary school, preferably the college counselor (Avila University, 2014). The credit hour and grading system are under the authority of each secondary school, however, Avila University converts the secondary school GPA using this scale presented in Table 11.

Through a variety of means, including but not limited to surveys, standardized examinations, and in-class assessments, Avila University is committed to a multidimensional, ongoing process of assessment to evaluate the performance of the academic achievement of the students (Avila University, 2014). Specifically, the assessment information is used “to determine student achievement, to evaluate the effectiveness of the curriculum, to guide the revision of programs, courses and instruction, and to serve as a catalyst to aid students in self-evaluation and goal setting” (Avila University, 2014, p. 45). At the same time, students have the right to appeal course grades through the established procedure as outlined in the 2014-15 Undergraduate Academic Catalog (Avila University, 2014).

All official academic records are maintained in the Registration and Student Records Office, as Avila University is in compliance with the 1974 Family Education Rights and Privacy Act, which “provides for the right to inspect and review educational records, to seek to amend those records, and to limit disclosure or information from the records” (Avila University, 2014, p. 38).

### **Data Collection Procedures**

The first step of data collection was to receive approvals from Baker University’s Institutional Review Board and Avila University’s Institutional Review Board. Therefore, an Institutional Review Board (IRB) request was submitted to Baker University on September 16, 2015 (*Appendix A*), and on September 23, 2015, the Baker University IRB committee approved the study (*Appendix B*).

Likewise, an Institutional Review Board request was submitted to Avila University on October 22, 2015 (*Appendix C*), and on October 26, 2015, the Avila

University IRB committee approved the research study (*Appendix D*). Once permission was granted by the IRBs of Baker University and Avila University, data from Avila University's Student Information System (Jenzabar EX) were extracted by Avila University's Information Management Coordinator using the reporting tool Sybase® Infomaker®, which was then imported into IBM® SPSS® Statistics Faculty Pack 23 for Windows.

The continuous archival variables included in the dataset were,

- 1) cumulative high school grade point average (0.0 to 4.0),
- 2) ACT composite score (0 to 36),
- 3) number of college credits earned in high school (numeric credits),
- 4) first-semester of college grade point average (0.0 to 4.0),
- 5) second-semester of college grade point average (0.0 to 4.0),
- 6) number of credit hours attempted first semester of college (numeric credits),
- 7) number of credit hours attempted second-semester of college (numeric credits),
- 8) number of credit hours earned first-semester of college (numeric credits),
- 9) number of credit hours earned second-semester of college (numeric credits).

The remaining variables were nominal and are shown in Table 12 with the code associated with each categorical variable.

Table 12

*Categorical Variable Data Coding*

Variable	Nominal Data Code
Male	1
Female	2
Resident	1
Commuter	2
Regular Admission	1
Provisional Admission	2
Provisional Restricted Admission	3
Month of Enrollment: January	1
Month of Enrollment: April	4
Month of Enrollment: May	5
Month of Enrollment: June	6
Month of Enrollment: July	7
Month of Enrollment: August	8
Development (DV) Math 1 <sup>st</sup> Year No	0
Developmental (DV) Math 1 <sup>st</sup> Year Yes	1
Returned Fall (Second Year): No	0
Returned Fall (Second Year): Yes	1

**Data Analysis and Hypothesis Testing**

The study was conducted to examine the following research questions to determine which combination of variables best predicts first year students' persistence to the second year. The research questions provided the basis for the data analysis.

RQ1. What combination of pre-enrollment variables (cumulative high school GPA, ACT composite score, number of college credits earned in high school, month of registration, type of admission offered, and gender) best predicts student persistence?

H1. A significant prediction model will be found using the pre-enrollment independent variables.

RQ2. What combination of post-enrollment variables (enrollment in a developmental math course, first-semester GPA, second-semester GPA, number of credits attempted in the first semester, number of hours earned in the first semester, number of credits attempted in the second semester, number of hours earned in the second semester, and residence status) best predicts student persistence?

H2. A significant prediction model will be found using the post-enrollment independent variables.

RQ3. What combination of pre- and post-enrollment variables best predicts student persistence?

H3. A significant prediction model will be found using the pre- and post-enrollment independent variables.

Binary logistics regression models were used to address each of the research questions. Logistic regression predicts the probability that an observation falls into one of two categories of a dichotomous dependent variable based on one or more variables that can be either continuous or categorical. Each categorical variable was dummy-coded before use in the data analysis. Testing the full model and then only the pre- and post-enrollment models to determine if a significant prediction model is present. To determine the odds of student persistence, the logistical regression equation can be used were as  $logit(p) = \beta_0 + \beta_1 * X_1$  with one predictor or  $logit(p) = \beta_0 + (\beta_1 * X_1) + (\beta_2 * X_2) + (\beta_{...} * X_{...})$  with two or more interaction predictors. The cut values for all models were 0.05.

**Limitations**

The results of the study will be interpreted with caution because of the following limitations. Participants in this study enrolled at Avila University after attending a variety of secondary schools which each have their own course grading scale, assessments, and strategies on how to calculate grade point average. Secondary schools also do not execute a common curriculum or remedial coursework. Additionally, the participants have diverse backgrounds in terms of where they were raised, gender, social-economic status, and ethnicity.

**Summary**

Provided in this chapter is a comprehensive description of the methodology and procedures used to address the research questions. The participants of this study enrolled in one specific institution, full-time, for their first year of college. The hypotheses were organized under the appropriate research questions. The data collection procedure and analysis method details have been provided. Provided in chapter four are the results of the hypothesis testing.

## **Chapter 4**

### **Results**

The purpose of this study was to identify a logistical regression model to predict first year college student persistence to their second year using pre- and post-enrollment variables. The study examined five years of data for first-time first year students enrolled full-time at Avila University. The study analyzed various independent variables to best predict their influence on the nominal dependent variable, student persistence. This chapter restates each research question (RQ), the hypothesis tested to address it, the statistical analyzes conducted to address each research question and the results of the hypotheses testing.

#### **Descriptive Statistics**

The sample of this research study consisted of 792 first-time first year students from the fall cohort classes of 2010 -2011, 2011-2012, 2012-2013, and 2013-2014 at Avila University. The following tables provide descriptive statistics on the continuous and categorical independent variables along with the dependent variable (Returned Fall). Table 13 provides the descriptive statistics for the continuous independent pre-enrollment variables used in the model showing that on average each student transferred in 4.51 college credits and earned a 3.30 GPA in high school.

Table 13

*Continuous Variable Descriptive Statistics*

	N	Minimum	Maximum	Mean	Std. Deviation
Transfer Hours	792	0.00	60.00	4.51	.287
ACT	792	10.00	34.00	22.69	.131
HS GPA	792	2.03	4.00	3.30	.017

Table 14 provides the descriptive statistics for the continuous post-enrollment variable used in the model showing that students were consistent in 1<sup>st</sup> Term and 2<sup>nd</sup> Term earning at 2.95 mean GPA. Additionally, in both terms student average earned credits were less than average attempted credit again showing consistency across terms.

Table 14

*Continuous Post-Enrollment Variable Descriptive Statistics*

	N	Minimum	Maximum	Mean	Std. Deviation
1 <sup>st</sup> Term Attempt	792	0	22	14.21	.069
1 <sup>st</sup> Term Earned	792	0	22	13.35	.119
1 <sup>st</sup> Term GPA	792	0.00	4.00	2.95	.035
2 <sup>nd</sup> Term Attempt	707	1	21	14.89	.080
2 <sup>nd</sup> Term Earned	707	0	21	14.06	.137
2 <sup>nd</sup> Term GPA	707	0.00	4.00	2.95	.035

Table 15 provides the descriptive statistics of the categorical pre-enrollment variables used in the model. The table shows the frequency of the variable within the model and the percent of the frequency in relation to the total number within the category. As shown in Table 15, the majority (a combined 90.4%) of first year students enrolled in the months of April, May and June.

Table 15

*Categorical Pre-Enrollment Variable Frequency*

	Frequency	Percent
Male	309	39.0
Female	483	61.0
Regular Admission	589	74.4
Provisional Admission	108	13.6
Provisional Restricted Admission	95	12.0
Month of Enrollment: January	3	0.4
Month of Enrollment: April	294	37.1
Month of Enrollment: May	284	35.9
Month of Enrollment: June	138	17.4
Month of Enrollment: July	45	5.7
Month of Enrollment: August	28	3.5

Table 16 provides the descriptive statistics of the categorical post-enrollment variables used in the model. The table shows the frequency of the variable within the model and the percent of the frequency in relation to the total number within the category. As shown in Table 16, less than one-third (27.8%) took developmental math in their first year and only 28.2% did not return to Avila University for their second year of college.

Table 16

*Categorical Post-Enrollment Variable Frequency*

	Frequency	Percent
Resident	465	58.7
Commuter	327	41.3
Development (DV) Math 1 <sup>st</sup> Year No	572	72.2
Developmental (DV) Math 1 <sup>st</sup> Year Yes	220	27.8
Returned Fall (Second Year): No	223	28.2
Returned Fall (Second Year): Yes	569	71.8

## Hypothesis Testing

RQ1. What combination of pre-enrollment variables (cumulative high school GPA, ACT composite score, number of college credits earned in high school, month of registration, type of admission offered, and gender) best predicts student persistence?

H1. A significant prediction model will be found using the pre-enrollment independent variables.

The hypothesis was accepted, as a significant logistics regression model was found. Two predictors (transfer hours and high school GPA) are positively correlated with the dependent variable (student persistence) and both contributed significantly to the model. Shown in Table 18 persistence is best predicted by two variables, transfer hours ( $b .074$ ,  $Wald X^2(1) = 16.918$ ,  $p < .000$ ), and high school GPA ( $b = .699$ ,  $Wald X^2(1) = 14.395$ ,  $p < .000$ ). The odds of persistence increase 1.077 times each increase of 1 hour earned credit prior to enrollment, compared to 2.012 times for each increase of 1-point increase to high school GPA. The odds of persistence for this Logistic Regression model is equal to  $-.570 + (.074 * \text{Transfer Hours}) + (.699 * \text{High School GPA}) \pm E$ . Nagelkerke's  $R^2$  of .110 indicated a weak relationship between prediction and grouping accounting for about 11% of the variance in the model. Prediction success for overall was 71.8% (*Appendix F*). These significant results suggest that 1) transfer hours and 2) high school GPA are the best predictors.

Table 17

*Logistic Regression Analysis Model Coefficients and Test for Pre-Enrollment Variables*

Predictor		Wald's $X^2$	df	Sig.
Step 1	Step	.074	1	.000
	Block	.699	1	.000
	Model	-1.570	1	.000
Step 2	Step		1	.000
	Block		2	.000
	Model		2	.000
Hosmer and Lemeshow Test		$X^2$		
Step 1		5.613	8	.690
Step 2		7.593	8	.474

Table 18

*Logistic Regression Analysis of Pre-Enrollment Variables Model Summary*

Step	-2 Log likelihood	Cox & Snell $R^2$	Nagelkerke $R^2$
1	900.911 <sup>a</sup>	.050	.072
2	878.761 <sup>b</sup>	.076	.110

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

b. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 19

*Logistic Regression Analysis of Pre-Enrollment Variables Step 2*

Predictor	B	SE B	Wald's $X^2$	df	sig.	Exp(B)
Transfer Hours	.074	.018	16.918	1	.000	1.077
High School GPA	.699	.184	14.395	1	.000	2.012
Constant	-1.570	.581	7.311	1	.000	.208

RQ2. What combination of post-enrollment variables (enrollment in a developmental math course, first-semester GPA, second-semester GPA, number of credits attempted in the first semester, number of hours earned in the first

semester, number of credits attempted in the second semester, number of hours earned in the second semester, and residence status) best predicts student persistence?

H2. A significant prediction model will be found using the post-enrollment independent variables.

The hypothesis was accepted, as significant logistics regression model was found. Two predictors (1<sup>st</sup> Term GPA and 2<sup>nd</sup> Term Earned Credit) are positively correlated with the dependent variable (student persistence) and both contributed significantly to the model. Persistence is best predicted by two variables, 1<sup>st</sup> Term GPA ( $b .625$ ,  $Wald \chi^2(1) = 18.183$ ,  $p < .000$ ), and 2<sup>nd</sup> Term Earned Credits ( $b = .180$ ,  $Wald \chi^2(1) = 32.593$ ,  $p < .000$ ). The odds of persistence increase 1.868 times each increase of 1 point higher GPA is the 1<sup>st</sup> term, compared to 1.197 times for each increase of credit hour earned 2<sup>nd</sup> term. The odds of persistence for this Logistic Regression model is equal to  $-2.877 + (.625 * 1^{\text{st}} \text{ Term GPA}) + (.180 * 2^{\text{nd}} \text{ Term Earned Credit}) \pm E$ . Nagelkerke's  $R^2$  of .242 indicated a moderate to weak relationship between prediction and grouping accounting for about 24.2% of the variance in the model. Prediction success for overall was 79.9% (*Appendix G*). These significant results suggest that 1<sup>st</sup> Term GPA and 2<sup>nd</sup> Term Earned Credits are the best predictors.

Table 20

*Logistic Regression Analysis Model Coefficients and Test for Post-Enrollment Variables*

Predictor		Wald's $X^2$	df	Sig.
Step 1	Step	99.189	1	.000
	Block	99.189	1	.000
	Model	99.189	1	.000
Step 2	Step	18.218	1	.000
	Block	117.407	2	.000
	Model	117.407	2	.000
Hosmer and Lemeshow Test		$X^2$		
Step 1		8.239	6	.221
Step 2		7.631	8	.470

Table 21

*Logistic Regression Analysis of Post-Enrollment Variables Model Summary*

Step	-2 Log likelihood	Cox & Snell $R^2$	Nagelkerke $R^2$
1	610.041 <sup>a</sup>	.131	.207
2	591.822 <sup>a</sup>	.153	.242

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 22

*Logistic Regression Analysis of Post-Enrollment Variables Step 2*

Predictor	B	SE	Wald's $X^2$	df	Sig.	Exp(B)
1 <sup>st</sup> Term GPA	.625	.147	18.183	1	.000	1.868
2 <sup>nd</sup> Term Earned Cr.	.180	.032	32.593	1	.000	1.197
Constant	-2.877	.454	40.196	1	.000	.056

RQ3. What combination of pre- and post-enrollment variables best predicts student persistence?

H3. A significant prediction model will be found using the pre- and post-enrollment independent variables.

The hypothesis was accepted, as significant logistics regression model was found. Two predictors (1<sup>st</sup> Term GPA and 2<sup>nd</sup> Term Earned Credit) are positively correlated with the dependent variable (student persistence) and both contributed significantly to the model. Shown in Table 25, persistence is best predicted by two variables, 1<sup>st</sup> Term GPA ( $b .625$ ,  $Wald X^2(1) = 18.183$ ,  $p < .000$ ), and 2<sup>nd</sup> Term Earned Credits ( $b = .180$ ,  $Wald x^2(1) = 32.593$ ,  $p < .000$ ). The odds of persistence increase 1.868 times each increase of 1 point higher GPA is the 1<sup>st</sup> term, compared to 1.197 times for each increase of credit hour earned 2<sup>nd</sup> term. The odds of persistence for this Logistic Regression model is equal to  $-2.877 + (.625 * 1^{st} \text{ Term GPA}) + (.180 * 2^{nd} \text{ Term Earned Credit}) +/- E$ . Shown in Table 24, Nagelkerke's  $R^2$  of .242 indicated a moderate to weak relationship between prediction and grouping accounting for about 24.2% of the variance in the model. Prediction success for overall was 79.9% (*Appendix H*). These significant results suggest that 1<sup>st</sup> Term GPA and 2<sup>nd</sup> Term Earned Credits are the best predictors.

Table 23

*Logistic Regression Analysis Model Coefficients and Test for Full Model*

Predictor		Wald's $X^2$	df	Sig.
Step 1	Step	99.189	1	.000
	Block	99.189	1	.000
	Model	99.189	1	.000
Step 2	Step	18.218	1	.000
	Block	117.407	2	.000
	Model	117.407	2	.000
Hosmer and Lemeshow Test		$X^2$		
Step 1		8.239	6	.221
Step 2		7.631	8	.470

Table 24

*Logistic Regression Analysis of All Variables Model Summary*

Step	-2 Log likelihood	Cox & Snell $R^2$	Nagelkerke $R^2$
1	610.041 <sup>a</sup>	.131	.207
2	591.822 <sup>a</sup>	.153	.242

a. Estimation termination at iteration number 5 because parameter estimated changed by less than .001.

Table 25

*Logistic Regression Analysis of All Variables Step 2*

Predictor	B	SE	Wald's $X^2$	df	sig.	Exp(B)
1 <sup>st</sup> Term GPA	.625	.147	18.183	1	.000	1.868
2 <sup>nd</sup> Term Earned Cr.	.180	.032	32.593	1	.000	1.197
Constant	-2.877	.454	40.196	1	.000	.056

**Summary**

The purpose of chapter four was to present the results of this study. It provided clarification on the descriptive statistics regarding the sample and each variable included. Furthermore, the descriptive statistics for each variable were provided based on the type

of variable (pre- or post-enrollment) and they type of variable (categorical or continuous). Three research questions and three hypothesis questions concerning first year college student persistence to second-year were analyzed using binomial Logistical Regression models.

Results of the hypothesis testing found that a significant logistical regression model was found for each hypothesis question. For pre-enrollment variable model, transfer hour and high school GPA were the two predictors that contributed significantly to the model. For the post-enrollment variable model, 1) 1<sup>st</sup> term GPA and 2) 2<sup>nd</sup> term credits earned were the two predictors that contributed significantly to the model. For the model that included both pre- and post-enrollment variables, 1) 1<sup>st</sup> term GPA and 2) 2<sup>nd</sup> term credits earned were the two predictors that contributed significantly to the model. The regression model indicated that student were more likely to persistent to their second year of college the higher their 1<sup>st</sup> term GPA was and the more credits earned in the 2<sup>nd</sup> term.

Chapter five provides a summary of the study including an overview of the problem, purpose statement and research questions. Additionally, chapter five includes a review of the methodology and major findings. Next, the findings related to literature are presented. Last, the conclusion is presented which includes the implications for action, recommendation for future research, and concluding remarks.

## **Chapter Five**

### **Interpretation and Recommendations**

With government and societal expectations that students not simply further their education post high school, but that they obtain the knowledge and ultimately the degree or credentials necessary to be successful in life. Chapter five summarizes the study, delivers an interpretation of the findings and how the findings relate to the available research, and offers recommendations and suggestions for future persistence studies.

#### **Study Summary**

Strong research on college student retention has been published but institutions exist in a particular context so detailed studies unique to an institution might provide the most relevant data to support reducing student departure (Hossler, 1991). This study examined pre- and post-enrollment variables to determine if they were statistically significant in predicting Avila University's first year students returning for their second year. No formal study had been conducted at Avila University in recent years regarding pre- and post-enrollment predictors for first year students returning to Avila for their second year.

#### **Overview of the Problem**

Avila University holds inconsistent year-to-year retention rates for their first year cohort. There is substantial evidence to suggest individuals and society benefit from higher education from occupational and higher pay attainment to social-political attitudes and civic engagement (Armstrong, Arum, & Stevens, 2008). Nonetheless, the federal government has increased their attention on student persistence and degree attainment. A college-educated workforce is critical in the United States of America to remain

competitive in the global marketplace (Tinto, 2012). Student departure prior to the second year is a shared concern by Avila University and other institutions of higher education.

### **Purpose Statement and Research Questions**

The purpose of this study was to identify the best combination of pre- and post-enrollment factors that best predict first year student persistence to their second year at Avila University. Additionally, the purpose was to determine the successful prediction percentage for student persistence and to determine the odds ratio for the predictive model. Three research questions were used to shape this study to align with the purpose of identifying indicators that best predict first year student persistence to their second year of college at the same institution. The following questions focus the research to look at specific data and were used for this study:

RQ1. What combination of pre-enrollment variables (cumulative high school GPA, ACT composite score, number of college credits earned in high school, month of registration, type of admission offered, and gender) best predicts student persistence?

RQ2. What combination of post-enrollment variables (enrollment in a developmental math course, first-semester GPA, second-semester GPA, number of credits attempted in the first semester, number of hours earned in the first semester, number of credits attempted in the second semester, number of hours earned in the second semester, and residence status) best predicts student persistence?

RQ3. What combination of pre- and post-enrollment variables best predicts student persistence?

### **Review of the Methodology**

The population of this study was new first year undergraduate students who had enrolled at Avila University since the fall of 2009. The sample selected was comprised of five first-time, full-time student cohorts who were entering their fall semester of college from 2009 until 2013. Students were selected for this study by purposive means.

In this quantitative study, binary logistic regression models were developed using archival data to address the research questions. The regression model predicts a categorical dependent variable from a set of predictor independent variables. The dependent variable was persistence to the second year of college.

### **Major Findings**

The major finding from this research is that the academic success that a student achieves during their first year of college provides more predictability than their high school academic achievements. College students who achieve a lower GPA in their 1<sup>st</sup> term must be mindful of their 2<sup>nd</sup> term course load in order to achieve necessary credits that would improve their likeliness of returning to Avila University the fall of their second year. This information was retrieved from the results of the hypothesis testing.

Results of the hypothesis testing found that a statistically significant correlation was found for each hypothesis question. Transfer hours and high school GPA were the two predictors that contributed significantly to the pre-enrollment model. 1<sup>st</sup> term GPA and 2<sup>nd</sup> term credits earned were the two predictors that contributed significantly to the post-enrollment model. When combining pre- and post-enrollment variables, the model

yielded the same findings as the post-enrollment model in that 1<sup>st</sup> term GPA and 2<sup>nd</sup> term credits earned were the two predictors that contributed significantly to the pre- and post-enrollment model. The regression analysis indicated that students were more likely to persist to their second year of college the higher their 1<sup>st</sup> term GPA was and the more credits earned in the 2<sup>nd</sup> term.

### **Findings Related to Literature**

College student persistence has been studied during the past 80 years with theoretical differences linking college student persistence to academic ability or social integration (Spady, 1970; Tinto, 1975; Astin, 1993, Chickering, 1969, Swail, 2004). Research continues in the twenty-first century to determine what variables best predict student persistence. This section will link findings from the study conducted on first year college student persistence to prior research.

The current study found that in a student's first year of college, 1<sup>st</sup> term GPA and 2<sup>nd</sup> term credits earned best predicted student persistence. Astin (1975) suggested that past academic performance is the greatest predictor of college student persistence through college which is not supported by this research. The findings in this study were relatable but not fully aligned to the findings from Stewart, Doo Hun and JoHyun's (2015) research that found high school GPA and 1<sup>st</sup> term GPA were significant predictors of first year student persistence.

This study did find that when only analyzing pre-enrollment variables, high school GPA combined with transfer hours were most predictive. These

findings do not support Astin's (1993) research that presented college grade point average can be predicted with modest accuracy from admission information and the two most potent predictors are the student's high school GPA and scores on a college admissions tests. Although high school GPA was predictive, college admissions tests (ACT) was not. In support of this research, ACT, Inc. (2002) found high school GPA was more accurate than ACT composite score in predicted first year student GPA.

This research did not find either of the pre-enrollment variables gender or type of admission predictive. Astin (1975) acknowledge that the ability to predict student drop-out is limited by setting admission policy.

Gender has various results when researched on its influence on college student persistence (Astin, 1975; Tinto, 1987; Reason, 2003), this study found that gender did not significantly predict first year college students returning for their second year at Avila University.

## **Conclusions**

This study was timely to inform Avila University as to what variables best predict student persistence. Avila is committed to improving first-year student retention and improving student success. The findings of this study could be used to help Avila improve their retention rate along with other similar colleges who struggle in the same regard.

## **Implications for Action**

The findings of this study should benefit Avila University in supporting first year students persisting to their second year. An awareness of the factors that are statistically

significant in predicting persistence should guide advising and academic planning for all first year students who enroll at Avila in future years. Avila University faculty and staff need to understand this research to best serve students. Higher education and Avila University may access this model to ensure students are being advised in a manner that best predicts their return, considering their 1<sup>st</sup> Term GPA and 2<sup>nd</sup> Term Credits Earned. To not take action on this research, Avila University would be not appropriately supporting first year students as they pursue a college degree.

### **Recommendations for Future Research**

This study allowed the researcher to explore factors that predict first year student retention. The following recommendations are made for other researchers interested in conducting a study on first year college student retention.

Using the same dataset, it is possible to build models that would predict attrition (student departure). Additionally, segmenting the data to determine if the predictive variables change based on student's gender or residential status.

Future research should also include student financial variables such as the students reported Expected Family Contribution (EFC) reported on the Free Application for Federal Student Aid (FAFSA) and specifically, take into account the unmet need of the student. Also, replicate this study but include student resilience and dedication to success in college, generally referred to as grit.

Duplicating this study at other colleges might provide an analysis that would offer that institution factors that predict their first year students persisting. Adding other factors, like student financial variable and "grit" might provide a more robust predictive

model. Changing the dependent variable from persistence to the second-year to persistence to obtaining a bachelor degree would also offer a valuable perspective.

### **Concluding Remarks**

In society today, education is under intense pressure to successfully prepare and credential students for their future. Educating students more effectively and efficiently will only be achieved through analysis of data to inform decisions focused on student's success. The literature on this topic varies by study on the actual predictors of student success; nonetheless, Avila University will utilize the findings from this research to better support student persistence. This study will empower other practitioner-researchers to find the answers necessary to help more first year college students persist.

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## Appendices

## Appendix B: Baker University IRB Application



Date: 8/16/15

SCHOOL OF EDUCATION  
GRADUATE DEPARTMENTIRB PROTOCOL NUMBER \_\_\_\_\_  
(IRB USE ONLY)

IRB REQUEST  
**Proposal for Research**  
**Submitted to the Baker University Institutional Review Board**

**I. Research Investigator(s)** (Students must list faculty sponsor first)

**Department(s)**            **School of Education Graduate Department**

Name	Signature
1. Dr. Dennis King	Major Advisor
2. Dr. Katie Hole	Research Analyst
3.	University Committee Member
4.	External Committee Member

Principal Investigator:            Brandon J. Johnson  
 Email: [brandon.johnson@avila.edu](mailto:brandon.johnson@avila.edu)  
 Mailing address: 53 E. 106<sup>th</sup> Terr. Kansas City, MO 64114

Faculty sponsor: Dr. Dennis King  
 Phone:  
 Email: [Dennis.King@bakeru.edu](mailto:Dennis.King@bakeru.edu)

Expected Category of Review:  Exempt     Expedited     Full

**II: Protocol: (Type the title of your study)**

Student Retention to Second Year of College: A Study of Pre-Enrollment and Post-Enrollment Variables to Predict Persistence

## Summary

### **In a sentence or two, please describe the background and purpose of the research.**

It is evident through economic and societal advantages that earning a bachelor's degree have a lasting impact on a variety of levels, from the individual student to society as a whole. The purpose of the research was to identify indicators that best predict first year student persistence to their second year of college at the same institution.

### **Briefly describe each condition or manipulation to be included within the study.**

No condition or manipulation will be included within this study.

### **What measures or observations will be taken in the study? If any questionnaire or other instruments are used, provide a brief description and attach a copy.**

Not applicable for this research as archival data will be used in this study. The following pre- and post-enrollment variables will be used: cumulative high school GPA, ACT composite score, number of college credits earned in high school, month of registration, type of admission offered, gender, enrollment in a development math course, first-semester GPA, second-semester GPA, number of credits attempted in the first semester, number of hours earned in the first semester, number of credits attempted in the second semester, number of hours earned in the second semester, and residence status.

### **Will the subjects encounter the risk of psychological, social, physical or legal risk? If so, please describe the nature of the risk and any measures designed to mitigate that risk.**

This research will not place any subject at risk of psychological, social, physical, or legal risk as archival data will be used in this study. Additionally, Avila University will comply with Family Educational Rights and Privacy Act (FERPA) to protect the well-being of each subject by not disclosing personal identifiable information.

### **Will any stress to subjects be involved? If so, please describe.**

This research will not offer stress to the subjects that are involved as all data were collected by the institution through its typical enrollment process. Avila University will comply with FERPA to protect the well-being of each subject by not disclosing personal identifiable information.

**Will the subjects be deceived or misled in any way? If so, include an outline or script of the debriefing.**

The subjects in this research will not be deceived or misled in any way as the all data will be archival so no direct interaction with subjects will take place.

**Will there be a request for information which subjects might consider to be personal or sensitive? If so, please include a description.**

The request of information will be made to Avila University and the subjects will be anonymous. The archived data in this study will not be identifiable by student name. No other personal identifications (social security number, student identification number) were requested to also guarantee anonymity. Avila University will fully comply with FERPA by not disclosing personal identifiable information.

**Will the subjects be presented with materials which might be considered to be offensive, threatening, or degrading? If so, please describe.**

The subjects in this research will not be presented with materials considered to be offensive, threatening, or degrading as all data were archived and collected through the typical enrollment process of the University.

**Approximately how much time will be demanded of each subject?**

Archived data will be used from Avila University's Student Information System (Jenzabar EX) so there will be no time demanded of each subject in this study.

**Who will be the subjects in this study? How will they be solicited or contacted? Provide an outline or script of the information which will be provided to subjects prior to their volunteering to participate. Include a copy of any written solicitation as well as an outline of any oral solicitation.**

Aggregated archived data will be used from students who enrolled at Avila University between the years of 2010-2013, including first year cohorts fall 2010, fall 2011, fall 2012, and fall 2013. Individual students will not be identified in this study. Student identification data will not be solicited or contacted, as archived cohort data is the focus of this study.

**What steps will be taken to insure that each subject's participation is voluntary? What if any inducements will be offered to the subjects for their participation?**

Aggregated archived data will be used from student that enrolled at institution between the years of 2010-2013. Individual students will not be requested or associated with the student data that will be utilized for this study. Therefore, all subject's participation is voluntary and no inducements will be offered.

**How will you insure that the subjects give their consent prior to participating? Will a written consent form be used? If so, include the form. If not, explain why not.**

Avila University Institutional Research Board must approve this research project prior to providing the first year student enrollment data for years 2010-2013 that will be requested. Avila University requires all research involving human participants carried on at the University or under the University's auspices must be reviewed and approved by the Institutional Research Board (IRB) of the institution. Included with this proposal of research is additional details on Avila University's IRB rationale for policy and application process (document title: AvilaUniversityResearchReviewBoardForm.pdf).

All data associated with this study is archival data from 2010-2013 school years.

**Will any aspect of the data be made a part of any permanent record that can be identified with the subject? If so, please explain the necessity.**

No aspect of the data will be made a part of any permanent record that can be identified with the subject.

**Will the fact that a subject did or did not participate in a specific experiment or study be made part of any permanent record available to a supervisor, teacher or employer? If so, explain.**

All subject personal information will be secure and confidential and no information about the individual participants or their participation in this study will be disclosed. Participation in this study will not be made part of any permanent record.

**What steps will be taken to insure the confidentiality of the data? Where will it be stored? How long will it be stored? What will be done with it after the study is completed?**

The archival unidentifiable data will be stored in a secure folder on the Avila University network assigned to the Principle Investigator. Individual student data will not be identified in this study and at point of data retrieval all personal identifiable information

will be excluded. Three years after this study is complete, all data will be permanently deleted and not recoverable.

**If there are any risks involved in the study, are there any offsetting benefits that might accrue to either the subjects or society?**

There are no risks involved in this research. Avila University's Institutional Review Board will need to approve this study to ensure that all student information is protected and secured while fully complying with FERPA.

**Will any data from files or archival data be used? If so, please describe.**

For this research only archival data will be used. The first year student cohort pre-enrollment variables that will be used are: cumulative high school GPA, ACT composite score, number of college credits earned in high school, month of registration, type of admission offered, and gender. The first year student cohort post-enrollment variables that will be used are: enrollment in a development math course, first-semester GPA, second-semester GPA, number of credits attempted in the first semester, number of hours earned in the first semester, number of credits attempted in the second semester, number of hours earned in the second semester, and residence status.

## Appendix B: Baker University IRB Approval

*Baker University Institutional Review Board*

9/16/15

Dear Brandon Johnson and Dr. King,

The Baker University IRB has reviewed your research project application and approved this project under Exempt Status Review. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

Please be aware of the following:

1. Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
2. Notify the IRB about any new investigators not named in original application.
3. When signed consent documents are required, the primary investigator must retain the signed consent documents of the research activity.
4. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.
5. If the results of the research are used to prepare papers for publication or oral presentation at professional conferences, manuscripts or abstracts are requested for IRB as part of the project record.

Please inform this Committee or myself when this project is terminated or completed. As noted above, you must also provide IRB with an annual status report and receive approval for maintaining your status. If you have any questions, please contact me at [CTodden@BakerU.edu](mailto:CTodden@BakerU.edu) or 785.594.8440.

Sincerely,

*Chris Todden EdD*  
Chair, Baker University IRB

Baker University IRB Committee  
Verneda Edwards EdD  
Sara Crump PhD  
Erin Morris PhD  
Scott Crenshaw

## Appendix C: Avila University IRB Application

**Avila University Institutional Review Board  
Request for Research with Human Subjects**

Name of Principal Investigator: Brandon J. Johnson

Mailing Address: 53 E. 106th Terr.  
Kansas City, MO 64114

Email Address: brandon.johnson@avila.edu

Phone Number(s): Home: \_\_\_\_\_  
Cell: 9136746190 Work: 8165013778

**Directions for Completing this form:**

Check one of the following and complete the portions noted.

- Avila University Student—complete part A on this page and go on to the next page
- Avila University Faculty/Staff—complete part B on this page and go on to the next page
- Investigator not connected with Avila using Avila students, faculty, or staff to collect research data—skip the remainder of this page and go to the next page

**Part A: To be completed by Avila University student applicants**

1. Student classification (check one)
  - Undergraduate Student
  - Graduate Student
  - Other: \_\_\_\_\_
2. Type of project (check all that apply)
  - Class Project or assignment:  
Course Number and Title: \_\_\_\_\_
  - Independent Research
  - Thesis Research
  - Other: \_\_\_\_\_
3. Name of Faculty Supervisor: \_\_\_\_\_

**Part B: To be completed by Avila University faculty or staff applicants**

1. Department: Enrollment Management
2. Type of project (check all that apply)
  - Personal research project
  - Thesis/Dissertation Research: Name of affiliated institution Baker University
  - Department or College/School Research
  - Institution-wide Research

## NIH Online Training

At Avila University, investigators involved in human subject research are required to take the NIH online training.

Directions for completing the NIH training:

1. Go to <http://phrp.nihtraining.com/users/login.php> and register before starting the online training.
2. Print into PDF your certificate of completion and submit it with your IRB application.

## Avila University Research With Human Participants

All research involving human participants carried on at the University or under the University's auspices must be reviewed and approved by the Institutional Review Board (IRB) of Avila University.

### Rationale for the Policy

In keeping with the mission and values of the University, Avila seeks to safeguard the rights and welfare of persons who agree to be participants in research activities. All persons have the right of self-determination and the rights of persons who are asked to be participants in projects must be protected. These rights include the right not to be harmed, the right to self-determination, the right to privacy, the right to obtain and maintain services, the right to maintain self-respect and dignity, the right to have confidential material remain confidential and the right to withdraw or refuse to participate without recrimination. Informed consent is necessary to protect persons engaged as participants in a research endeavor.

Research is broadly defined by the University and includes any activity that involves the gathering of data from human participants in any form other than standard accepted education classroom practices. Examples requiring IRB approval include, but are not limited to, the following: non-exempt questionnaires or surveys, interviews, observations, documents, bodily samples, specimens, procedures involving bodily manipulations, procedures involving experimental intervention, research involving minors, and research involving individuals unable for any reason to give informed consent. The use of human participants is a privilege granted to the investigator rather than a right. It is the responsibility of the Institutional Review Board to assure that the research meets minimal criteria established by Federal law and Federal regulations 45CFR 46, revised June 18, 1991.

Certain categories of use of human participants may apply for, and receive, a general approval that would cover repeated data gathering which follow the same guidelines as approved. For example, a class assignment involving the use of human participants which an instructor uses each time the course is taught may request a "standing" or "repeated use" approval for that particular class assignment as long as the same guidelines are followed as approved by the IRB. However, if the instructor of the course changes or if changes are made in the class assignment, the instructor must reapply for approval of the use of human participants. Individual student research projects for class requirements are NOT eligible for approval under this category. Individual student research projects MUST submit an application for IRB review and approval.

Program or service areas that will make repeated use of the same data collection techniques may also apply for approval one time only for all subsequent data-gathering efforts as long as the guidelines outlined in the application are followed. Any changes in the procedures would require a new application for approval.

### Application Process

1. Obtain a Request for Approval application for use of human participants from the Academic Affairs Office or on the Avila University web site or MyAU portal.
2. After completing the application, the investigator may **either submit the original application with the faculty supervisor's signature to the Vice-Provost for Academic Affairs who serves as the Chair of the Institutional Review Board OR submit the request electronically to the Academic Affairs mailbox (AcademicAffairs@Avila.edu) and to the faculty supervisor. If submitted electronically, the faculty supervisor must forward the email from the student indicating approval to the Academic Affairs mailbox.** Requests are reviewed on a continual basis during the fall and spring terms. Decisions are typically communicated to the investigator in two weeks or less during the fall and spring terms. If submitted between terms or in the summer, approval may take up to 60 days.
3. The chairperson of the Institutional Review Board informs the investigator of the decision of the IRB. A favorable decision is permission for the research to begin immediately. An application that is not approved may be resubmitted for approval with appropriate revisions.

02/00; 05/04, 5/10, 7/10, 11/10, 2/11

**Project/Research Information (To be completed by all applicants):**

Project Title: Student Retention to Second Year of College: A Study of Pre-Enrollment and Post-Enrollment Variables to Predict Persistence

Project/Research Start Date: 11/1/2015

Project/Research End Date: 5/1/2016

Approximate number of subjects to be involved in the research: 920

**Answer ALL of the following questions. (Please see attached explanations for clarification.)**

1. Does the research involve any of the following? Check Yes or No. If Yes, provide an explanation in the spaced provided below the item.

a. Access to subjects through a cooperating institution or agency?  Yes  No  
(A letter of cooperation from the agency or persons at the institution must be attached.)

b. Payment to subjects for participation?  Yes  No

c. Subjects who could be judged to have limited freedom of consent (e.g., minors, developmentally delayed persons, or those institutionalized)?  Yes  No  
(A consent form signed by a parent or guardian is required.)

d. Any procedures that might place the subjects at risk (psychological, physical, social, or economic)?  Yes  No  
(A signed consent form is required.)

e. Substances taken internally by or applied externally to the subjects?  Yes  No  
(A signed consent form is required.)

f. Fluids (e.g., blood, saliva) or tissues removed from the subjects?  Yes  No  
(A signed consent form is required.)

g. Deceiving subjects about the purpose of the research?  Yes  No

2. Will the subjects be asked to respond to any of the following areas of “sensitive” research (as defined by Public Health Service Act 301(d))? **Check all that apply.** Explanations and justifications should be included in questions 4 – 10 below.

- Relating to sexual attitudes, preferences, or practices.
- Relating to the use of alcohol, drugs, or other addictive products.
- Pertaining to illegal conduct.
- Information that, if released, could reasonably be damaging to an individual’s financial standing, employability, or reputation within the community.
- Information that would normally be recorded in a patient’s medical record, and the disclosure of which could reasonably lead to social stigmatization or discrimination.
- Information pertaining to an individual’s psychological well-being or mental health.
- Information in any other category that might be considered sensitive because of specific cultural or other factors.

3. Will the research use any of the following methodologies? **Check all that apply.**

- Repeated administrations of the same instrument or data collected over several contacts with subjects
- Individual (in person) administration or contact with subjects
- Group (in person) administration or contact with subjects
- Other distribution and collection involving no personal contact with subjects (including mail distribution, distribution through another person or agency, etc.)
- Written consent form for subjects to sign
- Data collected over more than one year
  
- Interviews
- Observations
- Surveys or questionnaires
- Audio or video recordings
- Usage of pictures or images of actual people (*permission required to be attached*)
- Materials from websites (*permission required to be attached*)
- Copyrighted materials (*permission required to be attached or source cited, as appropriate*)
- Debriefing procedures for deception projects

4. What is the purpose of the research?

It is evident through economic and societal advantages that earning a bachelor’s degree have a lasting impact on a variety of levels, from the individual student to society as a whole. The purpose of the research was to identify indicators that best predict first-year student persistence to their second year of college at the same institution.

5. Describe the proposed subjects. (Describe any special considerations such as age, gender, ethnicities, socio-economic status, etc.).

Aggregated archived data will be used from students who enrolled at Avila University between the years of 2010-2013, including first-year cohorts fall 2010, fall 2011, fall 2012, and fall 2013. Individual students will not be identified in this study. Student identification data will not be solicited or contacted, as archived cohort data is the focus of this study.

6. Describe how the subjects will be identified and recruited for participation in the project.

Aggregated archived data will be used from students who enrolled at Avila University between the years of 2010-2013, including first-year cohorts fall 2010, fall 2011, fall 2012, and fall 2013. Individual students will not be identified in this study. Student identification data will not be solicited or contacted, as archived cohort data is the focus of this study.

7. Describe the methodology for collecting data from subjects. (Attach another sheet if necessary.)

The request of information will be made to Avila University and the subjects will be anonymous. The archived data in this study will not be identifiable by student name. No other personal identifications (social security number, student identification number) were requested to also guarantee anonymity. Avila University will fully comply with FERPA by not disclosing personal identifiable information. Additionally, the archived data will be retrieved from Avila University's student information system (Jenzabar EX).

8. Describe how you will inform subjects of all of the following: (a) the purpose and benefits of the research, (b) assurances of confidentiality of responses, (c) voluntary participation, and (d) how and to whom results will be disseminated.

All subject personal information will be secure and confidential and no information about the individual participants or their participation in this study will be disclosed. Participation in this study will not be made part of any permanent record. Aggregated archived data will be used from student that enrolled at institution between the years of 2010-2013. Individual students will not be requested or associated with the student data that will be utilized for this study. Therefore, all subject's participation is voluntary and no inducements will be offered.

9. When and to what group(s) will the results be reported?

The results of this study will be found in chapter 4 of dissertation and most likely summarized to Avila University's Quality Initiative Team and Student Success Team.

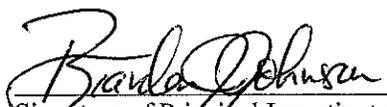
10. How will you store data and assure continued confidentiality of data collected from this project?

The archival unidentifiable data will be stored in a secure folder on the Avila University network assigned to the Principle Investigator. Individual student data will not be identified in this study and at point of data retrieval all personal identifiable information will be excluded. Three years after this study is complete, all data will be permanently deleted and not recoverable.

**Be sure to attach supporting documents including surveys, questionnaires and consent forms. If the subjects will be addressed in person, verbal directions and required statements noted in question 8 above must be scripted and attached. Most research studies require a statement of informed consent with all the elements in question 8 above. If personal contact could result in the identification of the subject, a written consent is required. Examples of informed consent forms are attached.**

**CERTIFICATION:**

By submitting this application, I am certifying that I have read, understand, and will comply with the policies and procedures of Avila University regarding human subjects in research. I agree that I will notify and receive approval from the Avila University Institutional Review Board before any changes are made to the project described in this request. I certify that all information submitted is accurate.

  
 Signature of Principal Investigator

10/21/15  
 Date

By signing below, I accept responsibility for assuring that procedures and materials follow the proposal as approved by the Institutional Review Board. Any awareness of violations will be reported to the Institutional Review Board.

\_\_\_\_\_  
 Signature of Faculty Supervisor  
 (required for student projects only)

\_\_\_\_\_  
 Date

**Institutional Review Board Action:**

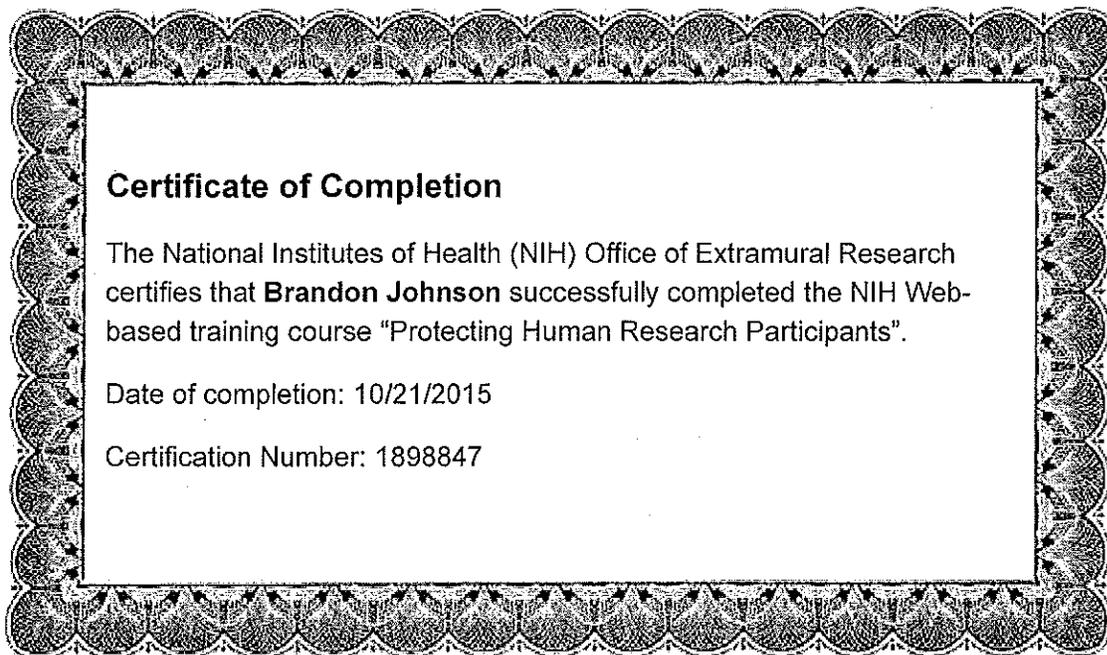
- The following information is still needed:  
 Project is not approved due to:

Notification of additional needs sent to applicant: \_\_\_\_\_

- Project is approved

\_\_\_\_\_  
 Signature of IRB Chairperson

\_\_\_\_\_  
 Date



Appendix D: Avila University IRB Approval



## AVILA UNIVERSITY

October 26, 2015

Brandon Johnson  
Vice President for Enrollment Management

Dear Brandon,

Your request for the research project entitled ***Student Retention to Second Year of College: A Study of Pre-Enrollment and Post-Enrollment Variables to Predict Persistence*** has been approved by the Institutional Review Board as submitted. It is understood that your research is expected to be completed by May 1, 2016.

I hope that your research goes well and is productive. If you have any further questions, please do not hesitate to call me at 816-501-3759 or by making an appointment in the Academic Affairs Office.

Sincerely,

Mary Knaus LeCluyse, J.D.  
Academic Affairs Support Specialist

MKL:ebh

## Appendix E: Pre-Enrollment Logistical Regression Classification

*Classification Table*

Observed	Returned Fall No	Returned Fall Yes	Percent Correct
Returned Fall No	0	223	0.0
Returned Fall Yes	0	569	100.0
Overall Percentage			71.8

- a. Constant is included in the model
- b. The cut value is .500

## Appendix F: Post-Enrollment Logistical Regression Classification

*Classification Table*

Observed	Returned Fall No	Returned Fall Yes	Percent Correct
Returned Fall No	0	142	0.0
Returned Fall Yes	0	565	100.0
Overall Percentage			79.9

- c. Constant is included in the model
- d. The cut value is .500

## Appendix G: Pre- and Post-Enrollment Logistical Regression Classification

*Classification Table*

Observed	Returned Fall No	Returned Fall Yes	Percent Correct
Returned Fall No	0	142	0.0
Returned Fall Yes	0	565	100.0
Overall Percentage			79.9

- e. Constant is included in the model
- f. The cut value is .500