ABSTRACT

DEGREENIA, ALYSSA ROSE. Early Withdrawal Factors That Affect Student Retainment to Graduation in the Agricultural Institute at North Carolina State University. (Under the direction of Dr. Elizabeth Wilson, Dr. David Jones, and Dr. Wendy Warner)

Student retention is a growing problem for institutions of higher education as faculty and administrators seek ways to enhance graduation rates. In the Agricultural Institute, a two-year program at North Carolina State University, the retention rates are low when compared to the four year agriculture program. Most studies examining influences on retention to graduation rates have focused on four-year public and private institutions. Consequently, research was conducted to determine the best predictive model for the dependent variable of student retention to graduation as related to the following independent variables: ethnicity, age, gender, high school GPA, high school class rank, parents’ educational attainment, use of financial aid, place of residence (rural vs. urban and distance from school), and first semester GPA. Data in this study were drawn from the Office of Enrollment Management and Services records for the 2009-2014 fall cohorts, consisting of 431 students. Findings indicated that those who struggled academically their first semester were at a heightened risk of discontinuing their education. In addition, older students were more likely to persist than younger students, and students with lower high school unweighted GPAs were more likely to drop out. Identifying factors such as these that affect retention rates are essential for the development of policies and procedures to help students reach graduation. It is recommended that university administrators work closely with first semester students through offering additional programs such as student mentoring and courses to enhance study skills.
Early Withdrawal Factors That Affect Student Retainment to Graduation in the Agricultural Institute at North Carolina State University

by
Alyssa Rose Degreenia

A thesis submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the degree of Master of Science

Agricultural Education and Extension

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APPROVED BY:

_________________________________________  _________________________________________
Dr. Elizabeth Wilson Dr. David Jones
Committee Chair

_________________________________________
Dr. Wendy Warner
DEDICATION

To my Dad, Mom, and Brothers: Thank you for the countless love and support that you always continue to show me.
BIOGRAPHY

Alyssa Degreenia grew up in Severna Park, Maryland with her parents, Todd and Gina Degreenia, and her brothers Joseph and David Degreenia. It was because of her love of pigs that she found herself an active member of 4-H and where her love for agriculture developed. Deciding she wanted to go somewhere a little warmer, Alyssa went to North Carolina State University where she majored in agricultural science with minors in animal science, agribusiness, and extension education. After graduation in May 2014, Alyssa was offered an assistantship at NC State to continue in agricultural education and extension. For Alyssa’s assistantship she worked with the Agricultural Institute, where she has found her passion for education and helped to develop several courses, a leadership program, and an internship program. Alyssa plans to one day work in postsecondary education and prepare for a PhD program in agricultural education with an emphasis in leadership. In her spare time, Alyssa enjoys spending time with family and friends, working with the animals on the farm, gardening, and going to the beach!
ACKNOWLEDGMENTS

I can’t thank my family, friends, and professors enough for the support that they have given me! I am so thankful that God put you in my life!

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for all of the laughs and the continuous support to be the best I can be, now and in the future. I appreciate our talks about life! Karl, I truly cannot thank you enough for the support you have given me to help get this thesis completed. You have really helped me to develop an understanding of statistics and I truly don’t think I could have done it without you! I admire the passion that you put into your work and your work with students.

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Last and certainly not least, thank you to my family and everyone at home! Mom, thanks for always pushing me to be the best I can be and encouraging me to want to be involved in everything! Dad, thanks for showing me what it means to be a hard worker and inspiring my educational career. I would not be the person I am without the support and love of you two. Joseph and David, thanks for being the best brothers I could ask for, always providing some good laughs, and asking me for help on papers/projects (sometimes I really do enjoy it!) I can’t wait to see what the future holds for both of you! Grandmom and Poppop, Nana and Poppop, and Mena and George thank you for always supporting and loving me since the day I was born; I have been so blessed.
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CHAPTER I: INTRODUCTION

Conceptual Framework

High retention rates reflect a strong overall academic program and are important to many different stakeholders including students, school administrators, and the society. The community college student is able to command higher earnings, the community colleges can offer more faculty jobs with more students enrolled, and the rest of the state residents benefit from the impact on the state’s economy (Stancill, 2015). According to Stancill (2015), 40% of North Carolina’s workforce has received their entire education from community colleges which has attributed to $19.6 billion in added state income or 322,000 new jobs. Higher retention rates to graduation in North Carolina community colleges, contribute to productive employees and citizens in the United States.

This study examined retention rates leading to graduation in the Agricultural Institute at North Carolina State University from fall 2009 to 2014. According to the Office of Enrollment Management and Services, the retention rates have been declining in this two year program and are significantly lower than the retention rates in the College of Agriculture and Life Sciences four year program. The low retention rates for the Agricultural Institute served as the impetus to complete this study in order to determine the different student variables that potentially influence retention rates. Below in Figure 1 is a preliminary report from Undergraduate Admissions of the fall to fall retention rates of the Associate and Bachelor degree programs from the 2006 to 2013 cohorts. For the first year, the average retention from year one to year two in the Agricultural Institute was 75.16%. For the first year, the average retention from year one to year two in the College of Agricultural and Life
Sciences was 91.35%. These data indicated the average difference between the retention rates of the Agricultural Institute and the College of Agricultural and Life Sciences for one year retention between years 2006 and 2013 is 16.2%.

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**Figure 1: Preliminary Report from Undergraduate Admissions**

Furthermore the average retention to graduation rate for 2–year public institutions in the United States from 2012 to 2013 was 59% according to the National Center for Education Statistics, (2015). This is compared to the national average retention to graduation rate of 80% for four year public institutions (National Center for Education Statistics, 2015). These data also showed there was a difference in retention rates depending on the acceptance rates at the institutions. The retention rate at a public four year institution with non-competitive, open admissions was 60%, whereas the retention rate at a public four year institution with less than 25% accepted was 95% (National Center for Education Statistics, 2015). From the institution’s perspective, it is important to retain students in order to sustain academic programs and for financial stability. (Fike & Fike, 2008)
**Community College Retention Rates**

The mission of the North Carolina Community College System is to open the door to high-quality, accessible educational opportunities that minimize barriers to post-secondary education, maximize student success, develop a global, multicultural and competent workforce, and improve the lives and well-being of North Carolina citizens (North Carolina Community College Systems, 2015). The North Carolina community college system originated in 1957 when the General Assembly adopted an act to provide funding. The North Carolina community college system currently has 840,000 students enrolled at one of the 58 community colleges (NCCCS, 2015). North Carolina community colleges also have a socioeconomic impact and return on investment. For every $1 spent by students they will gain $2.30 lifetime income, for every $1 spent by society they will gain $8.10 in added state income and social savings, and for every $1 spent by taxpayers $4.10 will be gained in added taxes and public sector savings according to a report from the North Carolina Community College Systems (2015). Retention rates for North Carolina Community Colleges across the board are low. In 2007, the average percentage of students that graduated, transferred, or were retained was 43.0% according to a report from North Carolina Community College Systems (2014).

College retention and graduation rates are important for a variety of reasons. Various institutions have different predictors of retention and there are limited studies that review community college retention rates. Community colleges serve all types of students including, but not limited to, those returning to school after time away, recent high school graduates, and those who are working and going to school at the same time. The Agricultural Institute is
unique in that it serves students with varying backgrounds in agriculture. According to Craig and Ward (2008) more students are lost in community colleges than four year universities because of the open-door admissions that let most all students in because of few admission requirements. As well as the additional personal challenges that most community college students face such as working full time. Also, according to Fike and Fike (2008) because of the open-door policy of community colleges, many students that are unprepared enroll which is not the case with the selective universities.

**Agricultural Institute at NC State University**

The Agricultural Institute (AGI) is a two year academic program that is a part of the College of Agriculture and Life Sciences at North Carolina State University. In this program students can earn their Associate of Applied Science Degree in an agricultural-related field. The Associate of Applied Science degree is different from an Associates of Arts degree because an Associates of Arts degree mainly focuses on the liberal arts and only a few classes are related to the student’s major. However, an Associate of Applied Science degree is also known as a vocational degree and the classes are mainly focused on the students’ major.

The Agricultural Institute was created in 1959 by an act of the North Carolina General Assembly in order to offer students who were seeking technical agricultural training but not requiring a four year degree (Agricultural Institute website, 2015). There are currently six majors including: Agribusiness Management, Field Crops Technology, General Agriculture, Livestock and Poultry Management, Ornamentals and Landscape Technology, and Turfgrass Management. Although earning a two year degree, AGI students, are able to
live on campus, participate in clubs/organizations, and have all of the same benefits as the students in the bachelor degree program except they are not able to participate in varsity sports because of NCAA regulations. In order to gain admittance into the Agricultural Institute, students must have a high school GPA of 2.25 and one letter of recommendation from a non-family member. The AGI students pay the same tuition and fees as undergraduate students and are eligible to apply for scholarships through the College of Agriculture and Life Sciences (Agricultural Institute website, 2015).

**Socioeconomic Background**

Obtaining an Associate of Applied Science degree has proved to have significant socioeconomic benefits for students and other stakeholders. The average additional earnings for an associate’s degree in North Carolina is $7,900 which is comparable to the National average of $7,200 (National Center for Higher Education Management Systems, 2003). This information indicates students are more likely to make more money if they complete further education after high school. This also indicates that income may be a motivating factor for continued education.

Among other reasons, students will attend college if their future earnings increase beyond their present investments and taxpayers will agree to fund colleges if the economic benefits exceed costs (Robison & Christophersen, 2003). The higher personal earnings of students’ helps society avoid costs of welfare and unemployment, health and crime (Robison & Christophersen, 2003). The investment of tax dollars from students receiving higher wages upon degree completion is very beneficial. The internal rate of return on tax dollars in North Carolina is 12.7% (Demonstrating the Collective Economic Value of North Carolina’s
Higher Education Institutions, 2015). The higher rate of return, the greater the benefit to the state government and the economy of the state (Robison & Christophersen, 2003). Education stakeholders need to understand community colleges impact society in more ways than the education they provide (Robison & Christophersen, 2003).

Students gain new skills by studying at higher education institutions, making them more productive workers. Students completing an associate’s degree are more likely to realize a positive employment experience than students who did not (Hoachlander et al., 2003). This study showed that those students that completed their degree have salary increases and increased job responsibilities (Hoachlander et al., 2003). Also, job satisfaction is important because it is associated with important behaviors and outcomes for employees that have implications for the well-being of the company and person (Spector, 1997).

**Tinto’s Integration Framework**

Tinto’s model is one of the most commonly recognized models of student integration and several additional theories have been developed based off of his initial work. Tinto (1975) stated that in order for students to be successful in college they must integrate socially and academically. This theory also indicates it is possible for a student to integrate socially but not academically or vice versa and this depends on the different institutions (Tinto, 1975). Background characteristics and expectational and motivational attributes are important to determine how successful a student will be, but it is the background characteristics that influence the students’ expectations and motivations (Tinto, 1975). The background characteristics in Tinto’s model included: gender and race; precollege experiences such as high school grade point averages; educational and social achievements;
and family background such as social standing, values, and expectations. Also, considering social integration is a part of Tinto’s Integration Framework, it may be unlikely or more difficult for students at community colleges to become socially involved (Karp & Hughes, 2010). Tinto’s conceptual schema for dropout from college is shown in Figure 2 (Tinto, 1975).

![Tinto's Conceptual Schema for Dropout from College](image)

*Figure 2: Tinto’s Conceptual Schema for Dropout from College*

In relation to this study, student characteristics can indirectly or directly be strong indicators as to whether students stay in school. This study mainly focused on the actual background characteristics of the students and not the students’ expectations and motivations because according to this theory, background characteristics are what strongly impact the expectations and motivations. Based on this theory, it could be argued that family background could be a very strong indicator of whether students stay in school. Family background could have an influence on how the students did in high school, the students’ social skills, and the students’ expectations. Finding ways to help students do better
academically might not be the only way to help students be successful in school. Retention policies and procedures need to focus on both the academic and social skills of students in order to help them succeed. The Agricultural Institute is unique as a community college because the students are able to be a part of all the same clubs and organizations as the students in the four year program. This allows for students to develop a better feeling of social attachment to their school. This sense of attachment is related to the students’ persistence in returning to the second year of college (Karp & Hughes, 2010).

Early Withdrawal Factors Associated With This Study

For the purpose of this study, the different early withdrawal factors were selected based off of the literature and were grouped into different categories: student demographics, high school academics, student characteristics, and college academics. The student demographics included: ethnicity, age, and gender. The high school academics that were used included: high school unweighted GPA and high school class rank. Student characteristics that were investigated included if the student is a first or non-first generation student, if the student received financial aid, if the student was from a rural vs. urban area, and the distance from home. College academics included the first semester GPA.

The factors influencing students to leave school before they complete their degrees are different from one school to another and the factors affecting retention rates are extremely varied (Bean, 1979). The majority of studies of student retention have been correlational studies at single institutions, and more recently there have been more attempts to explain the variations (Bean, 1979). Little is known about the reasons why a student is likely to leave a particular institution and this increases the importance of using a variety of
variables when trying to determine what affects retention rates (Bean, 1979). Research also indicates a comprehensive model of college student adjustment and retention needs to be created because there is not just one variable affecting retention rates but several variables are involved together (Aitken, 1982). Given the previous research, this study sought to better understand the variables that affect retention rates in the Agricultural Institute.

*Strategies to Improve Student Retention Rates*

The Agricultural Institute will be able to use the research findings from this study to develop better retention policies and procedures. Currently the Agricultural Institute offers an Enhancing Study Skills class and tutoring for students to help with retention and graduation rates. According to research, it is important to expand out of class support, integrate career and academic advising, improve new student orientations, and set up student coaching (Law, 2014). By identifying students at high risk of dropping out of their program, a variety of retention strategies can be implemented and targeted to these students (Igbo et al., 2011). Different retention strategies can be used and tailored to student demographics, student academics, or student characteristics. For example, mentoring has been found to be a helpful retention strategy in retaining minority students (Alvarez & Abriam-Yago, 1993). Parents of students that have college degrees are able to provide a better base of planning information and resources than parents with less education (Matthews, 2010). Therefore it might also be helpful to focus on mentoring students whose parents did not attend or complete college.
Statement of the Problem

The Agricultural Institute Associate of Applied Science degree program has experienced declining retention rates according to a preliminary report released by the Office of Undergraduate Admissions. These retention rates are also lower than the College of Agriculture and Life Sciences four year program. Public policy makers are interested in retention rates and additionally the federal Higher Education Act may use graduation rates as a measure of institutional effectiveness (Fike & Fike, 2008). There has been limited previous research through institutional data sources focusing on variables that affect student retention in the Agricultural Institute. Research about retention rates and graduation rates in community colleges is limited with most of the research occurring before the 1990s (Scoggin & Styron, 2006).

Increased retention rates begin with understanding the factors influencing academic success of first year students (Fike & Fike, 2008). By determining the relationship of variables associated with students leaving the Agricultural Institute before graduation, the Agricultural Institute will be able to develop a better understanding of factors that contribute to early withdrawal factors.

Currently the Agricultural Institute offers a course that is intended to help improve student retention. The students that were placed in this initial class were selected because they had a high school GPA below a 3.0, which was not based on previous research. The findings from this study will allow the Agricultural Institute to better understand which students are at risk of dropping out based on their demographics, academics, and characteristics. These at-risk students can then be placed in this Enhancing Study Skills
class or other retention strategies can be developed. Understanding why students stay in school or choose to leave is important because it can help make a difference in students’ lives (Fike & Fike, 2008).

**Purpose of the Study**

The purpose of this study is to determine the early withdrawal factors that have an effect on the retention to graduation rates in the Agricultural Institute. By determining the withdrawal factors affecting retention rates, the Agricultural Institute will be able to develop more efficient policies and procedures for helping students reach graduation.

The research questions that will explore the problem are as follows:

1. What is the strongest predictive model for the dependent variable of student retention to graduation in the Agricultural Institute as related to the following independent variables; (student demographics) ethnicity, gender, age, (high school academics) unweighted high school GPA, high school class rank, (student characteristics) receiving financial aid, first or non-first generation, distance from home, rural vs. urban, and (college academics) first semester GPA?

2. Are there any significant relationships between student demographics, high school academics, student characteristics, and college academics on Agricultural Institute retention rates?

3. What are the retention rates of students based on ethnicity, gender, age and the six different majors offered in the Agricultural Institute?
Definition of Terms

- **Associate’s Degree:** An award that normally requires at least 2 but less than 4 years of full-time equivalent college work (Integrated Postsecondary Data System, 2015).

- **Associate’s Degree of Applied Science:** Developed for people seeking technical skills to join the workforce (Batts & Pagliari, 2013).

- **Attrition:** Cessation of individual student membership in an institution of higher education (Bean, 1979).

- **Distance from Home:** Distance to a student’s parents or their own home (Bean, 1980).

- **Fall Cohort:** The group of students entering in the fall term established for tracking purposes. For the graduation rates component, this includes all students who enter an institution as full time, first time degree or certificate-seeking undergraduate students during the fall term of a given year (Integrated Postsecondary Education System, 2015).

- **Financial Aid:** Federal Work Study, grants, loans to students (government and/or private), assistantships, scholarships, fellowships, tuition waivers, tuition discounts, employer aid (tuition reimbursement) and other monies (other than from relatives/friends) provided to students to meet expenses. This excludes loans to parents (Integrated Postsecondary Education System, 2015).

- **First-Generation Students:** Students whose parents have not received a college education (Fike & Fike, 2008).

- **Non-Traditional students:** Adult students that are typically age 25 and over (Spitzer, 2000).
Assumptions and Limitations

For the purpose of this study it was assumed that:

- The data retrieved from the Office of Enrollment Management and Services was accurate research data.
- The researcher is employed by the Agricultural Institute but has not showed any researcher bias.
- The self-reported data was answered by the students correctly and to the best of their ability.
- The findings of the study are representative of future Agricultural Institute students.

The limitations of this study are listed below:

- There were a few self-reported items in the data and not all of the data fields were answered by the students. Cases had to be deleted because of the missing values.

Chapter Summary

Determining the withdrawal factors that affect the students’ ability to graduate is important in developing retention strategies for the Agricultural Institute, an Associates of Applied Science degree program at North Carolina State University. Retention rates are important to community colleges because of the socioeconomic impacts of students not attaining a degree. The research indicates that there are a variety of variables that can be used to further examine retention and the variables may differ from institution to institution. As stated in the research questions and hypotheses, this quantitative research study was used to understand if there is a relationship between the student demographics (ethnicity, age and
gender), high school academics (high school GPA and high school class rank), student characteristics (receiving financial aid, first or non-first generation, distance from home, rural vs. urban) and college academics (first semester GPA). By understanding relationships between these variables and determining predictors of retention, the Agricultural Institute will be able to design retention policies and programs to help retain students to graduation.
CHAPTER II: THEORETICAL FRAMEWORK AND REVIEW OF RELATED RESEARCH

The purpose of this study was to identify relationships that exist between student demographics, student academics, and student characteristics; and student retention to graduation. Determining what relationships exist among the listed variables will assist the Agricultural Institute in predicting student retention to graduation. This chapter focuses on the theoretical framework of why students drop out of higher education as well as a review of the literature in student retention. A review of the previous literature shows that multiple topics need to be addressed:

- Beans Student Attrition Model
- Student Demographics
- High School Academics
- Student Characteristics
- College Academics

Theoretical Rationale

There are several theories that help to explain what contributes to student dropout in higher education. Bean’s student attrition model (1979) is one of the first, basic attrition models. This model has served as the basis for understanding student retention rates.  

Beans Student Attrition Model

Bean has worked to develop several different theories as to why students leave school. The original model sought to explain the causes for employees to leave work
organizations. (Bean, 1980). Student satisfaction was the main focus in Bean’s model and the main reason why students stayed in school (Bean, 1980). In Bean’s causal model of student attrition, he concludes organizational determinants affect satisfaction at the institution but background variables must be taken into account in order to understand students’ interactions within the environment of the institution (Bean, 1979). University GPA for males and females was one of the original background variables that Bean found to influence student satisfaction (Bean, 1979). However, Bean’s original model did not include family characteristics as an important variable in student retention (Bean, 1979). Recent research and other models have confirmed that family characteristics are important variables.

Figure 3: Bean’s Student Attrition Model
Background variables are considered to be the underlying variables in whether students are satisfied with their experience at a university. Therefore, by understanding the common background variables in the students that are not satisfied, it will be easier to predict which students have an increased risk of leaving post-secondary education.

**Discussion of Related Research**

*Student Demographics: Ethnicity*

The different ethnicities of students have been an important variable in predicting retention rates. It is also important to note that higher percentages of minority students are more likely to enroll in community colleges than universities (Fike & Fike, 2008). This is mainly because students from ethnic minority backgrounds typically are more likely to come from low-income families and community colleges are a more cost efficient option. (Fike & Fike, 2008). According to the National Center for Education Statistics (2015), 54% of students in a 2 year public institution were white, 15% were black, 22% were Hispanic, 6% were Asian, 1% were American Indian/Alaska Native, and 2% were two or more races.

Some ethnicities are more likely to persist to receive their degree than others and the research has showed mixed reviews. In Matthews’ (2010) initial test of 954 college students from six universities including Texas State University, The University of Mary Hardin Baylor, Huston-Tillotson University, and Sam Houston State University revealed minority students were more likely than white students to drop out of college, which is a concern of many colleges and universities (Matthews, 2010). Desjardins et al. (1993) also concluded from previous research that minority students do tend to have higher probabilities of
dropping out of college. However, not all minorities have the same risk, according to a longitudinal study of 4,100 students from the University of Minnesota, Desjardins et al. (1993) found Asian American students were less likely to drop out in year one than their Caucasian counterparts. This longitudinal study also found African-American students are more likely than white students to dropout but there were no differences between Hispanics and their white counterparts (Desjardins et al., 1993). Another study of freshman from an undergraduate population of 20,000, researchers also found ethnic minorities were significantly less likely to be retained their first year of college (Wohlgemuth, Whalen, Sullivan, Nading, Shelley, & Wang, 2007).

**Student Demographics: Gender**

Previous literature indicates there are mixed reviews as to whether gender is an important indicator of early withdrawal. In a study of 87,915 students conducted by Reasons (2001) there was no indication that gender revealed any significant importance in determining retention rates. Ishitani and Desjardins (2003) also found in their longitudinal study of 3,450 students, that female dropout risks were not statistically different from those of male subjects. In a study of 9,200 community college students, Fike and Fike (2008) found gender was not a significant predictor of retention. Additionally, a longitudinal study of 4,100 students found there was no significant difference between males and females as to who was more likely to dropout (Desjardins et al., 1993).

According to a study completed by Rajasekhara and Hirsch (2000) of community college students, retention rates were generally higher among females. In a study conducted by Mills (2011) of 901 students, it was concluded only gender was significant in indicating
student success and females were 1.514 times more likely to successfully attain their degree than males. Buchmann and DiPrete (2006) found white women now have a higher rate of college completion than men.

**Student Demographics: Age**

According to the National Center for Education Statistics (2015), 55% of students in 2-year public institutions were under 25, 24% were 25 to 34 and 21% were 35 and older. College classrooms are becoming more diverse and more than 45% of all college students are considered nontraditional as they are age 25 and older (Spitzer, 2000). A recent study of 355 full-time undergraduates at St. John Fisher, a private college, looked at traditional (age 23 and under) and nontraditional (age 25 and over) undergraduates and determined nontraditional students perform better academically and are more decided about their career goals (Spitzer, 2000). Another study of 8,867 students as also found attrition does increase with age (Murtaugh, Burns, & Schuster, 1999).

However, the strength of using age as a predictor can be debated because according to previous research from Fike and Fike (2008), student age is not a significant predictor for fall to fall retention rates but is more significant for fall to spring retention rates. A longitudinal study of students from the University of Minnesota found older students are more likely to drop out than younger students which might be because they have a difficult time adjusting back to academic careers (Desjardins et al., 1993).

**High School Academics: High School Unweighted GPA**

High school GPAs play a major role in the admissions criteria to ensure students arrive to college capable of success (D’Amico & Dika, 2013). The way high school GPAs
are calculated varies from school to school, which can make it difficult to compare high
school GPAs (Warne et al., 2014). This topic has gained increased interest and a recent study
of 710 students from the Joint Admissions Medical Program in Texas found that unweighted
high school GPAs were better predictors of college GPAs (Warne et al., 2014). This same
study did indicate that although high schools GPAs were good predictors of college GPAs,
they were not the best indicator of student retention to graduation.

According to a study from D’Amico and Dika (2013) for 25,000 college students in a
diverse, public, urban doctoral institution, GPA was a significant predictor of retention to
graduation for first generation and non-first generation students. This finding also validates
the use of GPA in the admissions process. In another study of 863 full time students by
Hoffman and Lowitzki (2005), it was found the non-majority student’s high school grades
were better predictors of college academic success than test scores such as the ACT and SAT
tests.

High School Academics: Class Rank in High School

High school academic achievement is a strong indicator in predicting student
retention and class rank is a good indicator of academic achievement in high school.
According to a previous study, it was found as high school rank increased so did the
students’ retention and graduation rate (Wohlgemuth et al, 2007). In a study of 3,816 college
students with underrepresented minority students excluded, the researchers looked at SAT
scores, high-school class rank, and achievement test scores to determine predictors of college
performance (Baron & Norman, 1992). They found that high school class rank was the most
significant predictor of student persistence to graduation out of the three variables. In another
study it was also found that class rank can be a strong predictor of graduation but is not as strong of a predictor from first to second year retention (Whalen, Saunders, & Shelley, 2009).

**Student Characteristics: First Generation or Non-First Generation Students**

More obstacles exist for first generation college students to complete their degree than for non-first generation students. According to the findings from a study of 9,200 community college students, completed by Fike and Fike (2008), the students that had parents who had completed some college education was a predictor of student retention to graduation. Parents with postsecondary experience understand what it takes to be successful in college and what their child must do in order to be successful (Fike & Fike, 2008).

The study from D’Amico and Dika (2014) confirmed the previously established finding that if a student is a first generation college student, it presents a barrier to their academic performance in college. This study also indicated there may be additional factors affecting students’ performance and are indirectly related to if the student is a first generation student. Furthermore, research shows that students with a mother that has a bachelor’s degree or higher, were less likely to drop out (Ishitani & Desjardins, 2003). Students from first generation and low income backgrounds are less likely to enroll in college and be retained (Thayer, 2000).

**Student Characteristics: Financial Aid**

There have been mixed reviews as to how financial aid affects student retention rates because of the variance in the aid offered and received. According to a study from Ishitani and DesJardins (2003) on factors affecting student dropout over a period of time, students receiving financial aid generally had lower drop-out rates than non-aided students. This study
further found dropout rates varied depending on the amount and timing of financial aid. Cabrera, Nora, and Castaneda (1992) found with their sample of 466 college students, financial aid is important because it influences students’ commitment to stay in college and equalizes opportunities for high-income and low-income students. A 4-year longitudinal study from Fike and Fike (2008) of 9,200 students, found financial aid is a significant predictor of student retention to graduation. Sixty percent of the students in the previous study received financial aid and these students were more likely to stay to achieve fall to fall retention. However, more research is needed in order to determine how financial aid affects student persistence because of the different levels of financial aid available to students (Fike & Fike, 2008). Financial aid appears to effect retention rates based on the type of aid that is offered (Desjardins et al., 1993). Desjardins et al.(1993), also found from this longitudinal study that students who are in work-studies or receive scholarships are more likely to be retained. However, there is no statistical significance of students receiving grants, and students that receive loans have a statistical significance of dropping out. By using the different types of aid, this study did not ignore the effects of different types of aid on student retention (Dejardins et al., 1993).

Student Characteristics: Distance from Home

Distance from home is not a very commonly researched predictor of retention but it has shown to be significant in the research. According to a longitudinal study of 4,100 University of Minnesota students, the only significant effect of distance from home was students from tuition reciprocity states were less likely to leave in year one than those were not from Minnesota or were not reciprocity students (Desjardins et al., 1993). Other
researchers found a negative relationship between out of state students and student attrition (Ramist, 1981). According to Murtaugh, Burns, and Shuster (1999) study of 8,867 undergraduate students, non-residents had higher attrition rates than resident and international students.

*Student Characteristics: Rural vs. Urban*

The difference between a student coming from a rural background or urban background and the effect on retention rates is not as commonly researched. This is attributed to the fact that before the National Defense Education Act of 1958, there was not much of a push for access to higher education for all people (Tinto, 2004). There is also much less of a consensus among researchers for a common definition of rural, suburban or urban (Castaneda, 2010). According to research completed by Moore (1985) of 1,378 freshman students from six colleges in South Carolina, he found students from towns of less than 50,000 people had greater dropout rates. According to research conducted by Aylesworth and Bloom (1976) of 418 freshman students with rural and urban backgrounds from a large state university, the retention rates were lower for rural students.

*College Academics: First Semester GPA*

The first semester GPA of students has been found to be a strong indicator of student retention at the institution. In a study of 3,450 college students it was determined the higher a student’s first-year GPA, the less likely the student was to drop out of school (Ishitani & Desjardins, 2003). Also, students with first year GPAs between 1.00 and 1.99 had 150 % higher dropout rates than students whose GPA was between a 3.00 and 4.00. This is very consistent with other research surrounding first semester GPA and student retention.
Desjardins et al. (1993) found students who have higher college GPAs are less likely to drop out than those that have lower college GPAs in their study of 4,100 college students. Then in a study of 2,459 students, spring semester college GPAs were again found to be a significant predictor of persistence of minority and nonminority students the following fall semester (Cabrera, Nora, & Castaneda, 1993).

Summary

This chapter identified the theoretical framework for this study and why it is important to understand the different student background variables that can be used to predict student retention. Ethnicity, age, gender, high school unweighted GPA, class rank in high school, financial aid, first or non-first generation student, distance from home, rural vs. urban, and first semester GPA have all showed significance in predicting student retention in past research. This study will contribute to the literature on student retention and help future researchers identify significant variables to use.
CHAPTER III: METHODOLOGY

The purpose of this study was to determine the variables affecting the retention rates in the Agricultural Institute at North Carolina State University. By determining the withdrawal factors affecting retention rates, the Agricultural Institute will be able to develop more efficient policies and procedures for helping students reach graduation. More specifically, the study was intended to answer the following research questions:

1. What is the strongest predictive model for the dependent variable of student retention in the Agricultural Institute as related to the following independent variables: (student demographics) ethnicity, gender, age, (high school academics) unweighted high school GPA, high school class rank, (student characteristics) receiving financial aid, first or non-first generation, distance from home, rural vs. urban, and (college academics) first semester GPA?

2. Are there any significant relationships between student demographics, high school academics, student characteristics, and college academics on Agricultural Institute retention rates?

3. What are the retention rates of students based on ethnicity, gender, age and the six different majors offered in the Agricultural Institute?

For further clarification, the categories of student demographics, student academics and student characteristics include:

- Student demographics: ethnicity, gender, age
- High school academics: unweighted GPA, class rank
• Student characteristics: first generation or non-first generation student, financial aid, distance from home, rural vs. urban

• College Academics: first semester GPA

This chapter will describe the methodology involved in this study, including the research design, population of the study, data collection, instrumentation and data analysis.

**Research Design**

A quantitative research design was selected to determine and analyze if there is a relationship between student demographics, high school student academics, student characteristics, and college academics; and student retention to graduation. A quantitative methodology should be used when statistical analysis is needed to answer the research questions (Dawson, 2009). This research design was further selected because it allows the data to be displayed in charts according to the variables which will make it easier to view.

Logistic regression analysis was chosen for this study because of the ability to examine several independent variables and determine their influence on a dichotomous dependent variable of student retention to graduation. According to Cabrera (1994), logistic regression analysis can be traced back to the late 1960s and since then has been more commonly used in higher education educational research because of its ability to deal with dichotomous dependent variables.

This study was conducted on already existing institutional data and had to be obtained from the Office of Enrollment and Management Services. The dataset included information
about both the independent and dependent variables from the Agricultural Institute from 2009 to 2014.

The independent variables were determined by research regarding characteristics that affect retention rates. The dependent variable of the study was student retention as determined by graduation from the Agricultural Institute. The independent variables for the study were the background variables of the students, categorized into student demographics, high school student academics, student characteristics and college academics. These independent variables were identified as ethnicity, age, gender, high school unweighted GPA, class rank in high school, receiving financial aid, first or non-first generation students, distance from home, rural vs. urban, and first semester GPA.

**Population and Sample**

This quantitative study consisted of 431 past Agricultural Institute students in the years of 2009-2014. This was originally a census study because all of the Agricultural Institute students are the target population in this study and the information was easily accessible. The information regarding the student variables was obtained from the Office of Enrollment Management and Services at the time the student submitted their original application to the Agricultural Institute. The original data included 601 students but 170 students were dropped because there were missing variables. The 431 students were determined to be representative of the overall population. These missing variables are due to the fact that students over the age of 25 do not have to submit their high school academic information and not all of the variables included in this study are required on the application.
The missing data has been determined to be a limitation of the study. The results can be generalized for future Agricultural Institute students because the past students information is representative of the future students.

**Instrumentation**

The potential predictors for withdrawal focused on demographic and academic variables available from each student and were determined to be good predictors of retention from the literature. The data used for this study was obtained from the Office of Enrollment and Management Services and is considered to be accurate. The accuracy of this data is reflective of the accuracy of the results. The data is considered to be valid and reliable. The researcher decided to use this data as the data is the most accurate since the data is from the students’ admissions applications.

*Dependent Variable*

For the dependent variable of student retention, it was determined to be a dichotomous variable if the student reached graduation or not. If the student graduated they were dummy coded as a 1 and if they did not graduate they were dummy coded as a 0.

*Independent Variables*

For the data analysis, gender was dummy coded to be 1 for male and 0 for female. In the data analysis, student ethnicity was categorized into American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, Hispanic or Latino, and White. Due to low percentage of minorities, the data was dummy coded for 1 for
White and 0 for all other minorities. Student age was determined based on the birthdate of the student and then ages were analyzed on a continuous scale.

For the data analysis in the student academics category, student unweighted high school GPA was measured on a continuous scale. Class rank was determined based off of the percentage from class rank and class size and was on a continuous scale.

The first generation or non-first generation was coded for 1 if they were a first generation college student or 0 if they were not a first generation college student. If the students’ parents indicated they had completed high school or less they were determined to be first generation. Financial Aid was dummy coded for 1 if they received any type of financial aid and 0 if they did not receive any financial aid. Distance from home was then recorded as a continuous variable based on how many miles from the zip code that the student indicated as their place of residence on their application. Rural vs. urban was then determined by using the students zip code and the USDA Economic Research Service Rural-Urban Continuum Code. One was coded as counties in metro areas of 1 million population or more, 2 was coded as counties in metro areas of 250,000 to 1 million population, 3 was coded as counties in metro areas of fewer than 250,000 population, 4 was coded as urban population of 20,000 or more adjacent to a metro area, 5 was coded urban population of 20,000 or more, not adjacent to a metro area, 6 was coded urban population of 2,500 to 19,999, adjacent to a metro area, 7 was coded urban population of 2,500 to 19,999, not adjacent to a metro area, 8 was coded completely rural or less than 2,500 urban population, adjacent to a metro area, and 9 completely rural or less than 2,500 urban population, not adjacent to a metro area.
For college academics, the first semester GPA was determined on a continuous 4.0 scale for the GPA at the end of the first semester.

Data Collection Procedures

The purpose of this study was to determine the withdrawal factors associated with student retention rates in the Agricultural Institute at North Carolina State University. After obtaining approval from the IRB, data were obtained from the Office of Enrollment Management and Services. This data contained information as to whether the student reached graduation or withdrew early and the different demographics, academics, and variables associated with that student. The data spanned from fall of 2009 to fall of 2014. The student demographics, academic, and characteristics were obtained from their initial application to the Agricultural Institute. The college academics were obtained from the first semester GPA in the Agricultural Institute. The validity and reliability of the data was assumed to be reliable and valid.

Analysis of the Data

After the data were collected, it was then analyzed by using SPSS statistical software. Frequency statistics were computed for the sample with missing data and the original dataset. The frequency testing is what originally found the missing data. The removed cases were missing variables on the original application that were needed for the study.
Each independent variable of student demographics, high school academics, student characteristics and college academics was correlated with the student retention rates to identify significant relationships. Logistic regression was then used to determine what independent variables were significant predictors of the criterion variable. This allowed the independent variables to be combined to determine if there were any significant relationships when variables were viewed together. When using logistic regression, an equivalent statistic does not exist, so you use a pseudo r-squared which is a maximum likelihood estimate. For the Cox and Snell pseudo r-squared it represents the ratio of the likelihoods from the improvement of the full model over the intercept model (UCLA, 2011). Nagelkerkes pseudo r-squared adjusts Cox and Snell’s so that the range of possible values extends to one (UCLA, 2011). For the purpose of this study both pseudo r-squareds were reported.

All of the responses were dummy coded and data was numerical so the SPSS statistical software could run the logistic regression. Stepwise regression was used to determine the best model that best explained the dependent variable. The models were determined based off the categories of the independent variables (student demographics, high school academics, student characteristics, and college academics).

**Summary**

The quantitative research design was used to analyze the data and determine if there were any relationships between the independent variables of student demographics, high school academics, characteristics, and college academics; and the dependent variable of student retention to graduation rates. The population was considered to be all Agricultural
Institute students from the years of 2009 to 2014 without missing data. The data was collected from the Office of Enrollment Management and Services at North Carolina State University and determined to be reliable and valid. This study received IRB approval and the names of the students were left off of the data. The data was then placed into SPSS software to be analyzed. Using the SPSS software, correlational statistics and logistic regression were used to determine the best predictors of retention to graduation. The information from the past students is considered to be reflective of future Agricultural Institute students.
CHAPTER IV: RESULTS

The purpose of this study was to determine the different variables that affect student retention leading to graduation in the Agricultural Institute. A quantitative study using logistic regression was used to analyze relationships among the variables and find models best predicting the likelihood of the student being retained and graduating (dependent variable.) The findings from the statistical analysis will be presented according to descriptive statistics of the population, correlational statistics, and logistic regression models. The independent variables were broken into the different categories of student demographics, high school academics, student characteristics, and college academics.

Presentation of Findings

Student Demographics: Ethnicity, Gender, and Age- Descriptive Statistics

This category contained ethnicity, gender, and age as early withdrawal factors. The ethnicity factor was a dichotomy and the students were either in ethnicity-White or ethnicity-Minority. The ethnicities are based off of the Integrated Postsecondary Education Data System (IPEDS) classification and were classified as Asian, American Indian or Alaskan Native, Black or African American, Hispanic and White. Due to the low percentage of the different minority populations, the ethnicity factor was a dichotomy and the students were either in ethnicity-White or ethnicity-Minority. For the cohorts from 2009-2014, there were 431 students responses after deletion of the cases where there were missing variables. There were 431 student responses for ethnicity-White: 388 student responses and ethnicity-
Minority: 43 student responses. Table 1 lists the number of student responses for the factor ethnicity.

Table 1: Descriptive Statistics for Ethnicity

<table>
<thead>
<tr>
<th>Fall Cohorts</th>
<th>N</th>
<th>Ethnicity-White</th>
<th>Ethnicity-Minority</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2014</td>
<td>431</td>
<td>90%</td>
<td>10%</td>
</tr>
</tbody>
</table>

The independent variables of ethnicity revealed from the 431 student responses, there were 388 ethnicity-white respondents and 212 graduated. For the ethnicity-minority respondents there were 43 respondents and 19 graduated. Table 2 lists the retention rates for ethnicity-white and ethnicity-minority.

Table 2: Retention to Graduation Rates for Ethnicity

<table>
<thead>
<tr>
<th></th>
<th>N=431</th>
<th>Graduated</th>
<th>Not-graduated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2014 –</td>
<td>388</td>
<td>54.6%</td>
<td>45.4%</td>
</tr>
<tr>
<td>Ethnicity-White</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009-2014 –</td>
<td>43</td>
<td>44.2%</td>
<td>55.8%</td>
</tr>
<tr>
<td>Ethnicity-Minority</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The gender factor had two variables: male and female. Male was coded 1 and female was coded 0. For the cohorts from 2009-2014, there were 431 students responses after deletion of the cases where there were missing variables. There were 431 student responses for gender (gender-male: 344 student responses and gender-female: 87 student responses). Table 3 lists the number of student responses for the factor gender.
Table 3: Descriptive Statistics for Gender

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Gender-Male</th>
<th>Gender-Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Cohorts –</td>
<td>431</td>
<td>79.8%</td>
<td>20.2%</td>
</tr>
<tr>
<td>2009-2014</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The independent variables of gender revealed from the 431 student responses, there were 87 gender-female respondents and 50 graduated. For the gender-male respondents, there were 344 responses and 181 graduated. Table 4 lists the retention to graduation rates for males and females.

Table 4: Retention to Graduation Rates for Gender

<table>
<thead>
<tr>
<th></th>
<th>N=431</th>
<th>Graduated</th>
<th>Not-graduated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2014 - Females</td>
<td>87</td>
<td>57.5%</td>
<td>42.5%</td>
</tr>
<tr>
<td>2009-2014 – Males</td>
<td>344</td>
<td>52.6%</td>
<td>47.4%</td>
</tr>
</tbody>
</table>

The age factor had several different variables based off of the different ages that were reported. For the Fall Cohorts from 2009 to 2014 ages 17,18,19,20,21,22,23,24,25,30, and 31 were reported. There were 431 student responses for age (age-17: 37 student responses, age-18: 256 student responses, age-19: 73 student responses, age-20: 31 student responses, age-21: 14 student responses, age-22: 9 student responses, age-23: 6 student responses, age-24:1 student response, age-25: 1 student response, age-30: 1 student response, age-31: 2 student responses).
Table 5: Descriptive Statistics for Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Fall Cohorts – 2009-2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=431</td>
</tr>
<tr>
<td>17</td>
<td>8.6%</td>
</tr>
<tr>
<td>18</td>
<td>59.4%</td>
</tr>
<tr>
<td>19</td>
<td>16.9%</td>
</tr>
<tr>
<td>20</td>
<td>7.2%</td>
</tr>
<tr>
<td>21</td>
<td>3.2%</td>
</tr>
<tr>
<td>22</td>
<td>2.1%</td>
</tr>
<tr>
<td>23</td>
<td>1.4%</td>
</tr>
<tr>
<td>24</td>
<td>.2%</td>
</tr>
<tr>
<td>25</td>
<td>.2%</td>
</tr>
<tr>
<td>30</td>
<td>.2%</td>
</tr>
<tr>
<td>31</td>
<td>.5%</td>
</tr>
</tbody>
</table>

The independent variables of age revealed that from the 431 student responses there were 37 students age 17 and 22 graduated, there were 256 students age 18 and 132 graduated, there were 73 students age 19 and 35 graduated, there were 31 students age 20 and 20 graduated, there were 14 students age 21 and 8 graduated, there were 9 students age 22 and 6 graduated, there were 6 students age 23 and 4 graduated, there was 1 student age 24 and 1 graduated, there was 1 student age 25 and 0 graduated, there was 1 student age 30 and 1 graduated, and there was 2 students age 31 and 2 graduated. Table 6 lists the retention to graduation rates for age.
Table 6: Retention to Graduation Rates for Age

<table>
<thead>
<tr>
<th>Age</th>
<th>N=431</th>
<th>Graduated</th>
<th>Not-graduated</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>37</td>
<td>59.5%</td>
<td>40.5%</td>
</tr>
<tr>
<td>18</td>
<td>256</td>
<td>51.6%</td>
<td>48.4%</td>
</tr>
<tr>
<td>19</td>
<td>73</td>
<td>47.9%</td>
<td>52.1%</td>
</tr>
<tr>
<td>20</td>
<td>31</td>
<td>64.5%</td>
<td>35.5%</td>
</tr>
<tr>
<td>21</td>
<td>14</td>
<td>57.1%</td>
<td>42.9%</td>
</tr>
<tr>
<td>22</td>
<td>9</td>
<td>66.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>23</td>
<td>6</td>
<td>66.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>31</td>
<td>2</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>

College Academics: Majors

There were seven majors reported from the data. The Agricultural Institute currently recognizes six different majors and in 2009 there were seven including the pest management degree. For the cohorts from 2009-2014 there were 431 students responses after deletion of the cases where there were missing variables. There were 431 student responses for majors: agribusiness management: 117 student responses, field crops technology: 42 student responses, general agriculture: 52 student responses, livestock and poultry management: 106 student responses, ornamentals and landscape technology: 37 student responses, turfgrass management: 76 student responses, and pest management: 1 response. Table 7 lists the descriptive statistics for major.
Table 7: Descriptive Statistics for Major

<table>
<thead>
<tr>
<th>Major</th>
<th>Fall Cohorts -2009-2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=431</td>
</tr>
<tr>
<td>Agribusiness Management</td>
<td>27.1%</td>
</tr>
<tr>
<td>Field Crops Technology</td>
<td>9.7%</td>
</tr>
<tr>
<td>General Agriculture</td>
<td>12%</td>
</tr>
<tr>
<td>Livestock and Poultry Management</td>
<td>24.59%</td>
</tr>
<tr>
<td>Ornamentals and Landscape Technology</td>
<td>8.5%</td>
</tr>
<tr>
<td>Turfgrass Management</td>
<td>17.6%</td>
</tr>
<tr>
<td>Pest Management</td>
<td>.002%</td>
</tr>
</tbody>
</table>

From the 431 student responses for agribusiness management there was 117 students and 61 graduated, for field crops technology there were 42 students and 30 graduated, for general agriculture there was 52 students and 26 graduated, for livestock and poultry management there were 106 students and 59 graduated, for ornamentals and landscape technology there were 37 students and 23 graduated, for turfgrass management there were 76 students and 32 graduated, and for pest management there was 1 student and 1 student graduated. Table 8 lists the retention to graduation rates for major.

Table 8: Retention to Graduation Rates for Major

<table>
<thead>
<tr>
<th>Major</th>
<th>N=431</th>
<th>Graduated</th>
<th>Not-graduated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agribusiness Management</td>
<td>117</td>
<td>52.1%</td>
<td>47.9%</td>
</tr>
<tr>
<td>Field Crops Technology</td>
<td>42</td>
<td>71.4%</td>
<td>28.6%</td>
</tr>
<tr>
<td>General Agriculture</td>
<td>52</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Livestock and Poultry Management</td>
<td>106</td>
<td>55.6%</td>
<td>44.4%</td>
</tr>
<tr>
<td>Ornamentals and Landscape Technology</td>
<td>37</td>
<td>62%</td>
<td>38%</td>
</tr>
<tr>
<td>Turfgrass Management</td>
<td>76</td>
<td>42%</td>
<td>58%</td>
</tr>
<tr>
<td>Pest Management</td>
<td>1</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>
**Correlational Statistics**

Bivariate correlations between all independent variables and the dependent variable were completed so the independent variables could be viewed on an individual level. High school GPA, High School Rank, and First Term GPA were found to show statistical significance but had weak correlations. First term GPA had the strongest correlation of the variables. Table 9 displays the bivariate correlations.

*Table 9: Bivariate Correlations*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Graduated = 1</th>
<th>Not Graduated = 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduated Vs. Not Graduated</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>.063</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-.039</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.081</td>
<td></td>
</tr>
<tr>
<td>HS GPA</td>
<td>.311**</td>
<td></td>
</tr>
<tr>
<td>HS Rank</td>
<td>.299**</td>
<td></td>
</tr>
<tr>
<td>Financial Aid</td>
<td>-.086</td>
<td></td>
</tr>
<tr>
<td>First Generation vs. Non-first generation</td>
<td>-.044</td>
<td></td>
</tr>
<tr>
<td>Distance from home</td>
<td>.018</td>
<td></td>
</tr>
<tr>
<td>Rural vs. urban</td>
<td>.062</td>
<td></td>
</tr>
<tr>
<td>First Term GPA</td>
<td>.538**</td>
<td></td>
</tr>
</tbody>
</table>

*p (.05), **p(.01) ***p(.001), Two-tailed test

**Logistic Regression**

Logistic regression was used to determine the best model for explaining the variance associated with the dependent variable. Stepwise regression was used to determine the multiple regression model that best explains the dependent variable.

As seen in table 10, model one included the student demographics of age, gender, and race. Model two contained student demographics and high school academics of age, gender,
race, class rank, and unweighted high school GPA. Model three included student demographics, high school academics and student characteristics which contained ethnicity, age, gender, unweighted GPA, class rank, first generation vs. non-first generation student, financial aid, distance from home, and rural vs. urban. Model four includes college academics which is the first semester GPA, combined with all of the other independent variables. Cox and Snell and Nagelkerke were both reported and included as the pseudo $r^2$-squareds.

All of the models with the exception of model one indicate statistical significance. Model one explains approximately 1% of the variation in the dependent variable with no statistically significant coefficients.

Model two explains between 12% and 16% of the variation in the dependent variable of retention rates. Age and unweighted high school GPA are both positively and significantly correlated with the dependent variable. For each additional year of age the likelihood of students reaching graduation increased by a factor of 1.208. For each increase in unweighted high school GPA students were approximately 2.966 more likely to be retained.

Model three explains between 12% and 17% of the variation in the dependent variable. Age and high school unweighted GPA were also positively and significantly correlated in this model. For each additional year of age the likelihood of the student reaching graduation increased by a factor of 1.206. For each additional increase in unweighted high school GPA, a student increased the likelihood of making it to graduation by 3.030.
In the full model or model four explains between 30% and 40% of the variation in retention rates and includes all of the predictors and shows that first term GPA is the most significant predictor. For each additional increase in first semester, a student increased the likelihood of making it to graduation by 3.490. Table 10 reports the logistic regression models.
Table 10: Logistic Regression Models

<table>
<thead>
<tr>
<th></th>
<th>Model One</th>
<th></th>
<th>Model Two</th>
<th></th>
<th>Model Four</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>S.E.</td>
<td>O.R.</td>
<td>B</td>
<td>S.E.</td>
<td>O.R.</td>
</tr>
<tr>
<td>Gender</td>
<td>- .229</td>
<td>.244</td>
<td>.795</td>
<td>- .099</td>
<td>.262</td>
<td>.905</td>
</tr>
<tr>
<td>Age</td>
<td>.116</td>
<td>.069</td>
<td>1.123</td>
<td>.189</td>
<td>**.071</td>
<td>1.208</td>
</tr>
<tr>
<td>Race</td>
<td>.436</td>
<td>.325</td>
<td>1.547</td>
<td>.532</td>
<td>.358</td>
<td>1.702</td>
</tr>
<tr>
<td>HS GPA</td>
<td>1.087***</td>
<td>.377</td>
<td>2.966</td>
<td>1.108***</td>
<td>.394</td>
<td>3.030</td>
</tr>
<tr>
<td>HS Class Rank</td>
<td>1.460</td>
<td>.853</td>
<td>4.307</td>
<td>1.431</td>
<td>.878</td>
<td>4.181</td>
</tr>
<tr>
<td>Financial Aid</td>
<td>- .197</td>
<td>.216</td>
<td>.822</td>
<td>- .222</td>
<td>.247</td>
<td>.801</td>
</tr>
<tr>
<td>First Generation</td>
<td>- .190</td>
<td>.229</td>
<td>.827</td>
<td>- .185</td>
<td>.261</td>
<td>.831</td>
</tr>
<tr>
<td>Distance from Home</td>
<td>- .002</td>
<td>.002</td>
<td>.998</td>
<td>.000</td>
<td>.002</td>
<td>1.000</td>
</tr>
<tr>
<td>Rural vs. Urban</td>
<td>.012</td>
<td>.056</td>
<td>1.008</td>
<td>.067</td>
<td>.064</td>
<td>1.069</td>
</tr>
<tr>
<td>First Term GPA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.250***</td>
<td>.152</td>
</tr>
<tr>
<td>Cox and Snell R Square</td>
<td>.013</td>
<td>.124</td>
<td>.129</td>
<td>.165</td>
<td>.172</td>
<td>.405</td>
</tr>
<tr>
<td>Nagelkerke R Square</td>
<td>.017</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p (.05), **p (.01) ***p (.001), Two-tailed test
The findings of this study will help administrators of the Agricultural Institute find the most appropriate policies and procedures to help increase retention rates. Determining the causes of why students are leaving the Agricultural Institute before graduation can help administrators identify target groups of students they need to work with. By identifying these target groups of students, specific procedures to help these students can be implemented.

Summary of Procedures

The purpose of this study was to determine if there are any significant relationships between the early withdrawal factors and the retention to graduation rates of the Agricultural Institute. The Agricultural Institute is the two year program at North Carolina State University and the retention rates are much lower than that of the four year program. Sending students into the workforce upon graduation significantly boosts the economy and is beneficial to all stakeholders, including the students, the college, and the general public.

By determining the factors affecting these retention rates, it will help the Agricultural Institute to create more specific policies and procedures to help students graduate. This study focused on specific variables that had been determined from previous studies to be statistically significant and good predictors of retention.
The following research questions were used:

1. What is the strongest predictive model for the dependent variable of student retention in the Agricultural Institute as related to the following independent variables; (student demographics) ethnicity, gender, age, (high school academics) unweighted high school GPA, high school class rank, (student characteristics) receiving financial aid, first or non-first generation, distance from home, rural vs. urban, and (college academics) first semester GPA?

2. Are there any significant relationships between student demographics, high school academics, student characteristics, and college academics on Agricultural Institute retention rates?

3. What are the retention rates of students based on ethnicity, gender, age and the six different majors offered in the Agricultural Institute?

The population of this study, after cases with missing values were deleted, involved 431 students from fall semester cohorts from 2009 to 2014. Using the data retrieved from the Office of Enrollment and Management Services at North Carolina State University from the initial applications of students an analysis of the data was completed. The Statistical Package for the Social Sciences (SPSS) software was utilized for the analysis and to determine if there were any significant relationships. Logistic regression was used to study the independent variables of ethnicity, age, gender, unweighted high school GPA, high school class rank, receiving financial aid, first or non-first generation, distance from home, rural vs. urban, first semester GPA and their effect on the dichotomous variable of being retained to graduation.
Summary of Findings

Logistic regression was used to examine the relationships of the ten different independent variables and the ability to predict retention of Agricultural Institute students to graduation. Of these ten independent variables of ethnicity, age, gender, unweighted high school GPA, high school class rank, receiving financial aid, first or non-first generation, distance from home, rural vs. urban, and first semester GPA, there were three that made significant contributions to the logistic regression models. These variables included age, unweighted high school GPA, and first semester GPA. The strongest predictor of retention across all of the models was first semester GPA in the Agricultural Institute. An increase of one point in cumulative GPA made the student 3.490 more likely to be retained to graduation. Age was also a significant predictor with each increasing year of age the likelihood of the student reaching graduation increased by a factor of 1.206. For each additional increase in unweighted high school GPA, a student increased the likelihood of making it to graduation by 3.030. Each of the significant contributions to the regression models were in different categories, as age falls in student demographics, unweighted high school GPA falls in the high school academics category, and first semester GPA falls in the college academics category.

Conclusions

The findings from this study produced some expected and unexpected findings based upon previous research on variables that affect student retention rates. It can be concluded that there is a best predictive model for students after they have completed a semester of
college and there is a best predictive model for students before they complete any college based on their background demographics and high school academics. From the findings, it can be concluded the best predictive model was the model that included all of the variables, model four, because this model accounted for the highest amount of variance and first semester GPA was statistically significant. It can be concluded that for each additional GPA point in the students first semester, the odds of graduating are higher by a factor of 3.490. Students with a low first semester GPA are more likely to drop out which could be due to the fact that they go on academic probation or have a hard time increasing their cumulative GPA after it is so low that first semester. With a lower first semester GPA students may find they are not ready for college and become easily discouraged which could lead to dropping out.

Model three would also be a good predictive model in order to help determine what students are likely to drop out before they even start college. This model indicated age and unweighted GPA are significant predictors of retention leading to graduation. An increase of one point in cumulative high school unweighted GPA made the student 3.030 more likely to be retained to graduation. The student is more likely to be retained to graduation if they did well during high school. Age was also a significant predictor, with each increasing year of age, the likelihood of the student reaching graduation increased by a factor of 1.206. The older the student, the more likely the student is to reach graduation and if the student is directly out of high school they are less likely to reach graduation.
Implications

The results of this study are supported in the literature by Tinto's (1975) theoretical framework (Figure 1) and Bean's (1979) attrition model (Figure 2). The results of this study indicate that age, unweighted GPA, and first semester GPA are significant indicators of predicting retention to graduation. This supports the work of Tinto (Figure 1), who indicated background characteristics such as individual attributes and high school grade point averages are important predictors of student retention. Bean's attrition model (Figure 2) also noted the importance of university GPA as a significant predictor of student attrition, however Bean's model did not focus on background characteristics that affect retention rates.

First semester GPA was determined to be the best and most significant predictor of student retention from the model that involves all of the variables. However, previous research, Tinto (1975) and Bean (1979) indicate other variables can be just as important as first semester GPA. In the student demographics category Wohlgemuth, Whalen, Sullivan, Nading, Shelley, and Wang (2007) and Matthews (2010) found minorities were more likely to drop out of college, and Rajasekhar and Hirsch (2010) and Mills (2011) found females had higher retention rates. The results from this study did not indicate student demographics besides age were very significant. But in the previous research, Mutaugh, Burns, and Schuster (1999) and Fike and Fike (2008) found mixed reviews in whether age was a significant predictor.

In the high school academics category, Warne et al. (2014), D'amico and Dika (2013), and Hoffman and Lowitzki (2005) found high school GPA was a good indicator of student retention and Wohlgemuth et al. (2007) and Baron and Norman (1992) found class rank was
a good indicator of student retention. High school GPA was found to be a good indicator in this study but not as strong as first semester GPA of college. Class rank was not found to be a significant predictor in this study.

In the student characteristics category, Fike and Fike (2008), D'Amico and Dika (2014), and Thayer (2000) found students that were first generation students were more likely to drop out of school. There were mixed reviews as to if receiving financial aid was significant in determining if a student was going to drop out. Studies by Ramist (1981) and Murtaugh, Burns, and Shuster (1999) found the farther from home, the more likely the student was to drop out. Studies from Moore (1985) and Aylesworth and Bloom (1976) found retention rates were lower for rural students. In this study, none of the student characteristics were significant indicators of retention rates.

In the college academics category, Ishitani and Desjardins (2003) and Cabrera, Nora, and Castaneda (1993) found a low first semester GPA was a strong indicator of early withdrawal and this finding was supported by the findings from this study.

**Recommendations**

*Recommendations for Practice*

The results of this study show those who struggled academically their first semester were at a heightened risk of discontinuing their education. Those that entered college at a younger age and those that had a lower high school GPA also have a greater risk of discontinuing their college education. Identifying factors affecting retention rates are essential for the development of policies and procedures to help students reach graduation.
Based off of the results from this study, policies and procedures need to be developed to offer students academic support.

First semester GPA showed up in both models and it especially important to give students the help they need that first semester whether that is through a group or one-on-one setting. By giving students the help they need during their first semester, it will help to improve their first semester GPA and increase their potential for continuing to graduation. The introduction courses (AGI 101) every student must take are especially important and the instructors of those classes need to focus specifically on helping students to be successful for the rest of their college career. It may be helpful to require progress reports in these classes and smaller class sizes for the instructor to get to know the students and focus on their individual needs. Those students with a high school GPA of 3.0 or lower could be placed into an additional class to help them work on their study skills. This class needs to be more student-centered and focused on enhancing academics. The Agricultural Institute has already started implementing a new study skills course and these findings support putting students with a GPA of 3.0 or lower in that class.

Advising or mentoring from professors and senior students is also important this first semester to help the students start off their college career successfully. Advising and career counseling is needed because students may find they are not in the correct major and with advising they could find the correct major for them instead of dropping out. After a low first semester GPA, it might be appropriate to mentor those students in their second semester to determine what can be done to help them be successful in school.
The initial application to the Agricultural Institute should put more emphasis on requiring the students to fill out all sections of the application so that data does not have to be deleted for missing values. This can further help in determining predictors of being retained to graduation.

**Recommendations for Future Research**

Further replication of this study could be completed with a larger population size. This study focused on the fall semester cohorts but the spring and summer cohorts could also be included in the study. If students are required to upload information at the time of their application it will also allow for there to be less missing data and therefore more students can be included.

Another study could also be done to help determine when exactly the students are dropping out of the Agricultural Institute. For example, it would be good to know if students are leaving after their first, second, third, or fourth semester because this will help administrators to be able to determine when they need to intervene to catch these students.

Further replication of this study could also be completed in other community colleges in North Carolina or in the four year institution at North Carolina State University. This will help in doing a comparison study with the Agricultural Institute and the other institutions.

Another suggestion is to study what happens to the students after they leave the Agricultural Institute. For example, the students could be transferring to other schools and therefore still completing their degree in another 2-year or 4-year program. Also, since the Agricultural Institute is specific to agriculture it would be interesting to study if students stay in the agricultural field after they leave the Agricultural Institute.
The review of literature revealed that there were many different variables that could affect retentions rates and this study added to this body of literature. However, more variables could be reviewed such as size of high school and the specific type of financial aid. A closer look could also be given to the education level of the mother instead of just looking at the highest education level of both parents.

Surveys could also be given to all first year students in order to determine their future goal attainment and motivation to be used as variables. These surveys could also be used to determine if students are lacking the social support they need and therefore leaving the Agricultural Institute. Qualitative research could also be completed in the form of interviews for students that have said they will not return the following semester. This will help in understanding why students leave the Agricultural Institute.
REFERENCES


http://harvest.cals.ncsu.edu/agricultural-institute/


http://www.higheredinfo.org/catcontent/students_states/NorthCarolinaProfile.pdf


APPENDIX
Appendix A

Dear Elizabeth Wilson:

IRB Protocol 6667 has been assigned Exempt status

Title: Variables that Effect Retention Rates in the Agricultural Institute

PI: Wilson, Elizabeth

The research proposal named above has received administrative review and has been approved as exempt from the policy as outlined in the Code of Federal Regulations (Exemption: 46.101. Exempt b.4). Provided that the only participation of the subjects is as described in the proposal narrative, this project is exempt from further review. This approval does not expire, but any changes must be approved by the IRB prior to implementation.

NOTE:

1. This committee complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NCSU projects, the Assurance Number is: FWA00003429.
2. Any changes to the research must be submitted and approved by the IRB prior to implementation.
3. If any unanticipated problems occur, they must be reported to the IRB office within 5 business days.

Please forward a copy of this notice to others involved in this research, if applicable. Thank you.

Thank you,
The IRB Team