Grade Point Average as a Predictor of Timely Graduation from Associate Degree Registered Nursing Programs

Delores J. Jackson
Western Michigan University

Follow this and additional works at: https://scholarworks.wmich.edu/dissertations

Part of the Health and Physical Education Commons, and the Nursing Commons

Recommended Citation
Jackson, Delores J., "Grade Point Average as a Predictor of Timely Graduation from Associate Degree Registered Nursing Programs" (2010). Dissertations. 572.
https://scholarworks.wmich.edu/dissertations/572

This Dissertation-Open Access is brought to you for free and open access by the Graduate College at ScholarWorks at WMU. It has been accepted for inclusion in Dissertations by an authorized administrator of ScholarWorks at WMU. For more information, please contact wmu-scholarworks@wmich.edu.
GRADE POINT AVERAGE AS A PREDICTOR OF TIMELY GRADUATION FROM ASSOCIATE DEGREE REGISTERED NURSING PROGRAMS

by

Delores J. Jackson

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Philosophy
Department of Interdisciplinary Health Sciences
Advisor: Joyce Thompson, Dr.P.H.

Western Michigan University
Kalamazoo, Michigan
May 2010
GRADE POINT AVERAGE AS A PREDICTOR OF TIMELY GRADUATION FROM ASSOCIATE DEGREE REGISTERED NURSING PROGRAMS

Delores J. Jackson, Ph.D.
Western Michigan University, 2010

The purpose of this study was to determine if admission selection strategies that utilize cumulative and/or pre-requisite GPA are predictive of timely graduation for associate degree nursing (RN-AD) students. Data were obtained from de-identified records of 437 associate degree nursing students enrolled in three Midwest community colleges from 2003–2006. Of the total sample, only 44% of the students graduated on time (i.e., in four semesters or two years). Although a statistically significant difference was found for timely graduation rates between colleges (ranging from 29% in College B to 54% in College A), no relationship was found for cumulative GPA, pre-requisite GPA, age or race/ethnicity with timely graduation in the total sample (N = 437). Logistic regression revealed that neither cumulative nor pre-requisite GPA was predictive of timely graduation even after controlling for college. The rationale for using selective admission criteria that include pre-requisite or cumulative GPA is based on the assumption that competitive admission criteria using grades draw the most qualified students with the highest probability for graduation. The results of this study do not support the assumption that those with the highest probability of graduating on time can be found by admitting individuals by pre-requisite or cumulative GPA. Other factors for timely graduation from associate degree nursing programs must be investigated to
determine which independent variables are predictive of timely graduation, including research that targets single science courses and cluster variables as predictors. In addition, further research into reasons for high attrition rates and prolonged graduation are urgently needed.
ACKNOWLEDGMENTS

I would like to acknowledge my appreciation for the skilled assistance of Dr. Joyce Thompson, Dr. Nickola Nelson, and Dr. Amy Curtis in the completion of my dissertation. Their expert support enabled me to produce a document of which I am proud. They are professional scholars which fittingly aided my writing and research, and caring friends when the journey included painful, serious life event obstacles that required pause. I will always be grateful for this support and guidance.

I would like to thank my husband and dearest friend, Rick, for believing in me. From high school sweetheart through my ADN, BSN, MSN, and now PhD programs, his loving support and confidence in me never faltered. As with all milestone events in our shared lives, we knew we could “get through it together.”

I would also like to thank my mother, Catherine. She joined us when she needed help and ended up helping us! When I was totally immersed in writing, she tirelessly cooked, cleaned, and washed clothes. “Thanks, Mom! I don’t know what we would have done without you!”

Delores J. Jackson
# TABLE OF CONTENTS

ACKNOWLEDGMENTS ........................................................................................................... ii  
LIST OF TABLES .................................................................................................................... vi  
LIST OF FIGURES .................................................................................................................. vii  

CHAPTER

I. INTRODUCTION ................................................................................................................ 1  
  Statement of the Problem ............................................................................................... 1  
  The Nursing Shortage ................................................................................................. 1  
  Nursing Education Pathways and Responses to Nursing Shortage ..................... 2  
    A Description of Nursing Education Pathways ...................................................... 2  
    Nursing Shortage Effects on Nursing Programs .................................................. 4  
  Solutions for the Nursing Shortage ......................................................................... 5  
    The Role of Associate Degree Nursing Programs ............................................ 5  
    Significance of the Research .............................................................................. 9  
    Research Questions ............................................................................................. 15  

II. LITERATURE REVIEW .................................................................................................. 16  
  Introduction ............................................................................................................... 16  
  Admission Criteria ................................................................................................... 18  
    Grade Reliability for Measuring Achievement and Learning ......................... 18  
    Predicting Minority and Non-traditional Students’ Success Using Grades ........ 20
# Table of Contents—Continued

## CHAPTER

<table>
<thead>
<tr>
<th>Measures</th>
<th>53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis</td>
<td>56</td>
</tr>
</tbody>
</table>

### IV. RESULTS | 58
| Introduction | 58 |
| Results Related to Research Questions | 68 |
| Brief Summation of the Results | 71 |

### V. DISCUSSION | 73
| Summary of Results | 73 |
| The Relationship of These Results to Previous Research | 75 |
| Possible Explanations for Study Results | 77 |
| Strengths and Limitations | 79 |
| Implications for Practice and Future Research | 81 |
| Conclusions | 85 |

## REFERENCES | 88

## APPENDIX

| Approval Letter from the Human Subjects Institutional Review Board | 98 |
LIST OF TABLES

1. Percentages Representing Each Letter Grade at Colleges A, B, and C for Nursing Courses ................................................................. 54

2. Sample Descriptive Statistics (N = 437) for Key Study Variables .............. 59

3. Age at Admission, by College ....................................................................... 60


5. Race/Ethnicity, by College ........................................................................... 62

6. Admission Pre-requisite and Cumulative GPA for the Colleges .................. 63

7. On-Time Graduation Rates for Colleges A, B, and C ................................. 64

8. Race/Ethnicity Groups’ Performance Related to On-Time Graduation ........ 65

9. On-Time Graduation by Pre-requisite and Cumulative GPA ....................... 66

10. Pre-requisite and Cumulative GPA Ranges at Admission Related to Age at Admission ............................................................................. 67

11. Logistic Regression Results for Pre-admission Cumulative GPA and Timely Graduation ....................................................................... 69

12. Logistic Regression Results for Pre-admission Pre-requisite GPA and Timely Graduation ....................................................................... 69

13. Logistic Regression Results for Age, Race/Ethnicity, Cumulative GPA, Colleges, and Timely Graduation ...................................................... 70

14. Logistic Regression Results for Age, Race/Ethnicity, Pre-requisite GPA, Colleges, and Timely Graduation ...................................................... 71
LIST OF FIGURES

1. Pathways to Entry Level RN ................................................................. 3
CHAPTER I

INTRODUCTION

Statement of the Problem

The Nursing Shortage

The registered nurse shortage in the U.S. is a national concern. Registered nurses include those prepared in 2-year associate degree programs and those prepared in 4-year baccalaureate degree programs. The U.S. Department of Health and Human Services (2002) predicts that the nation’s nursing shortage will worsen significantly within the next two decades. Over a million new and replacement registered nurses (RNs) are needed by 2012 according to the Bureau of Labor Statistics (American Association of Colleges of Nursing, 2005, March). The shortage is expected to deepen due to increasing baby boomer retirements and too few new nurses entering the profession (Auerbach, Buerhaus, & Staiger, 2007). By the year 2020, 88% of the states and the District of Columbia are anticipated to have significant RN shortages (American Association of Colleges of Nursing, 2005, June 20), creating a registered nurse vacancy rate of over 29% nationally (U.S. Department of Health and Human Services, 2002). The nursing shortage affects patient care quality and accessibility (Joint Commission on Accreditation of Healthcare Organization, 2002). It also increases pressure on nursing programs to admit and graduate more future nurses (Seldomridge & DiBartolo, 2004).
Nursing Shortage Effects on Patient Care

The nursing shortage has negative impacts on patient care. The Agency for Healthcare Research and Quality (AHRQ) reported findings from a synthesis of nursing research that concluded that hospitals with lower registered nurse staffing levels had higher incidences of poor patient outcomes (Buerhaus & Needleman, 2000). In August 2002, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) examined 1,609 reports of patient deaths; low levels of registered nurse staffing were believed to have contributed to a quarter of the cases (Joint Commission on Accreditation of Healthcare Organization, 2002). A 2005 study (Buerhaus, Donelan, Ulrich, Norman, & Dittus, 2005) indicated that 75% of polled registered nurses believed that the shortage presented a major concern for patient safety and quality of care. The nurses also stated that the shortage induced stress and discontent into their lives. All these factors could heighten the exodus of hospital nurses who provide direct patient care, which would intensify the shortage further.

Nursing Education Pathways and Responses to Nursing Shortage

A Description of Nursing Education Pathways

Three pre-licensure educational pathways are available for students who want to become registered nurses (see Figure 1). The least commonly used pathway currently is the diploma program. Diploma programs are three year hospital based programs that have decreased in prevalence as RN education programs have moved into college and
university systems (American Association of Colleges of Nursing, 2008). A second pathway is the associate degree program offered by community and junior colleges. These programs are designed to take approximately two years to complete. They currently constitute the most frequently adopted nursing program choice in the U.S. The third option is the university based baccalaureate program. It requires about four years to earn the degree, Bachelor of Science in Nursing (BSN). BSN programs represent more than one-third of the RN schools currently active in the U.S. (American Nurses Association, 2008).

Graduates from all three types of nursing programs take the same NCLEX-RN examination after program graduation (Bureau of Labor Statistics, 2008). By 2005–2006, 59% of all U.S. nursing programs were associate degree and 37% were baccalaureate. Hospital-based diploma schools comprised only 4% (American Nurses Association,
Generally, licensed graduates from any of these three program types qualify for entry-level positions at the time of initial licensure.

**Nursing Shortage Effects on Nursing Programs**

The RN shortage has increased the pressure on nursing programs not only to accept more students, but more importantly, to increase the supply of graduates (Seldomridge & DiBartolo, 2004). After a lull in nursing school enrollments in the 1990s, schools experienced significant admission and enrollment increases in 2003–2004. Admissions to all pre-licensure RN programs were up over 20%, with associate degree programs taking the lead at +28% (National League for Nursing, 2005). However, just increasing the number of individuals admitted to nursing programs does not guarantee they will successfully complete those programs. Approximately one-third of all students admitted to nursing programs fail or exit prior to graduation (Kibrick, 1963; Levitt, 1971; Moore, 1996; Oliver, 1985). Consequently, emphasis must be placed on increasing the number of graduates, for it is the graduate who becomes eligible to sit for the licensing examination and, if successful, to practice as a RN. Successful admission strategies in associate degree nursing programs may be one way to promote timely graduation of more registered nurses to meet patient care needs, which is particularly important during a time of nursing shortage. This is one reason for the current study.

Graduations for all pre-licensure RN programs increased in the early 2000s. Collectively, nursing programs experienced a 26% graduation increase (National League for Nursing, 2005). Although these increases were considerable, they are still insufficient
to meet the future projected demand for registered nurses. According to a Health Resources and Services Administration report (Dall, Biviano, Tise, Fritz, & Spencer, 2004), nursing programs will have to graduate approximately 90% more nurses relative to current projections to meet the anticipated growth in demand for registered nurse services in the next decade.

Solutions for the Nursing Shortage

The Role of Associate Degree Nursing Programs

Relevant to the current research, associate degree programs provide the majority of nursing graduates. Sixty-three percent of the employed U.S. registered nurses in the late 1990s graduated from associate degree programs (Auerbach, Buerhaus, & Staiger, 2001). In 2004, there were 674 nursing programs offering bachelor’s degrees and 846 programs offering associate degrees in nursing (Bureau of Labor Statistics, n.d.). Associate degree programs educate approximately two thirds of all registered nurse graduates (Auerbach, Buerhaus, & Staiger, 2001), so evidence of effectiveness of these programs in graduating more nurses is important to the U.S. population as well as to the nursing profession.

Associate degree nursing programs are in a good position to have a positive impact on the nursing shortage. Associate degree programs were established to prepare qualified registered nurses in two years as compared to four years required in university nursing programs. Thus, increasing the number of associate degree graduates per cohort potentially could have twice the impact on reducing the nursing shortage when compared
to implementing the same cohort strategy in university four-year nursing programs, given that the same number of students are admitted and graduate. That is, if 60 students graduate every two years from an associate degree program, the yield from start to finish in four years would be 120 graduates. Sixty students admitted to a 4-year baccalaureate program would take the full four years to graduate; hence only 60 graduates could complete the program from start to finish in four years.

Since time from admission to graduation is key in producing more nurses from any nursing program, timely completion leading to graduation is critical (Ellis, 2006; Smith, 1990). Particular to this study, the associate degree nursing student must be able to enter and graduate in the allotted two-year period to impact the shortage more quickly. Timely completion is defined as progression through the program’s required curriculum in sequential order without interruption or exit during the usual allotted time for completion of all required coursework. This measurement starts with the first semester which usually includes the skills or fundamentals course equivalents, and concludes with completion of the final required course in the program, at which point the status of “graduate” is conferred. In the current study, completion is defined operationally as program graduation.

As noted above, two strategies for addressing the current nursing shortage are to: 1) increase the number of students admitted to pre-licensure nursing programs and 2) increase the number of graduates from those programs. Unfortunately, strained financial resources, limited clinical site availability, state mandated student/faculty ratios at clinical sites, and dwindling numbers of qualified faculty all may limit a program’s capacity to
increase enrollments (Byrd, Garza, & Nieswiadomy, 1999; Seldomridge & DiBartolo, 2004). Barriers to increasing enrollments are outside the scope of this research. The focus of this study was to explore whether grade-related admission selection strategies might improve the associate degree nursing students’ probability for timely graduation.

Strategies that address timely graduation could help to alleviate another important problem in nursing programs that does not help the nursing shortage—attrition. Attrition within nursing programs is very costly. The educational institution, future employers, the healthcare system, and the student all lose when an admitted student is unable to graduate. Losses can be measured financially for educational institutions, as well as the individual student and family. There are also emotional ramifications for the student, family, and faculty who have invested time into student success (Lengacher & Keller, 1990; Oliver, 1985; Poorman & Webb, 2000, Vance & Davidhizar, 1997). About one-third of all students admitted to nursing programs fail or exit (Kibrick, 1963; Levitt, 1971; Moore, 1996, Oliver, 1985; Wells, 2003). Associate degree programs generally experience the highest levels of attrition (Hill, 2007; Mohammadi, 1994; Oliver, 1985). Hill found that about half of community college associate degree nursing program students graduated on schedule. One-quarter of the students took three to four years to complete the associate degree and about one-quarter of the group never graduated. Therefore, associate degree research that targets admission criteria aimed at admitting students with a high probability for timely graduation could provide valuable data for nursing program administrators and their respective colleges or universities.
One approach to improving timely graduation is to admit qualified students who can be expected to complete the pre-licensure nursing program in four years for the baccalaureate program and two years for the associate degree program. The question that was investigated in the current study asked if GPA related admission criteria are predictive of timely graduation. Several studies have looked at the relationship of pre-admission selection criteria using grade point average (GPA) and standardized test scores, such as the American College Test (ACT), or Scholastic Aptitude Test (SAT) with graduation from baccalaureate programs (Byrd, Garza, & Nieswiadomy, 1999; Campbell & Dickson, 1996; Clemence, & Brink, 1978; Hayes, 1981; Higgs, 1984; Potolsky, Cohen, & Saylor, 2003; Yang, Glick, & McClelland, 1987). However, few published studies (Felts, 1986; Higgins, 2005; Oliver, 1985; Sayles, & Shelton, 2005) were found that examined the relationship between pre-admission GPA and graduation in associate degree programs (See next section for details of studies). Numerous researchers have investigated the relationships of pre-admission criteria and other predictive variables for NCLEX-RN success in both baccalaureate and associate degree nursing programs.

It is hypothesized that factors associated with timely graduation may differ from factors associated with success on the NCLEX-RN examination. The current study differed from existing research in two ways. First, it differed by focusing on associate degree nursing programs when nursing research literature predominately represents BSN programs. Second, it differed in its outcome variable of timely graduation instead of NCLEX-RN results. Therefore, this study addressed the problem at an earlier point,
recognizing that before taking the NCLEX-RN, a student must first graduate from a state recognized nursing program (National Council of State Boards of Nursing, 2005).

Significance of the Research

The current study was designed to explore relationships between certain admission criteria and timely graduation in two-year associate degree programs; specifically, to understand grade point average (GPA) as an admission tool for associate degree nursing programs in relationship to progression and persistence to timely graduation. Studying the use of grades as an admission criterion for associate degree programs is particularly important because the practice is not universally accepted by community colleges, which typically support open enrollment philosophies and policies. Yess (1980) noted that community colleges have long adhered to an open-door policy for admissions and that this unimpeded access is the mechanism used to insure educational opportunity for all those interested in pursuing a college education. This philosophy is counter to competitive admission or selectivity. However, if the use of pre-admission GPA admission selectivity is demonstrated to increase timely graduation rates, the possibility of meeting the community need for more registered nurses sooner might justify reappraisal of the open-door policy for nursing program admissions in community colleges. On the other hand, if GPA has no effect on timely graduation, open admission policies might be viewed more positively.

During periods when potential nursing students were in ample supply, competitive or selective admissions were popular (Nash, 1977). In the 1970s when the baby-boomers
were entering college in large numbers, the most universal admission criteria for schools of nursing involved some measure of an applicant’s prior academic performance, such as GPA. Schools that had previously utilized an open enrollment or “first come, first serve” approach began to use selective admission procedures. Grade point average requirements were raised for entry. Pre-requisite course grades were also considered. Past academic performance was believed to be evidence of students’ potential for success. When applications for nursing program admissions declined, so did the use of selective and competitive admission (Nash, 1977). However, as history repeats itself and applicant numbers exceed available enrollment space, faculty members are again faced with the option of selecting applicants who are most likely to succeed (Agho et al., 1999; Gallagher, Bomba, & Crane, 2001). Fowles (1992) recommended that all nursing schools evaluate nursing program admission criteria to determine if their process of recruiting and admitting students draw those most likely to succeed, particularly when sufficient numbers of applicants allow for selective choice.

Using GPA for admission criteria has been studied for its value in predicting graduation from baccalaureate allied health education, but results have not been conclusive or consistent (Agho, Mosley, & Williams, 1999; Byrd, Garza, & Nieswiadomy, 1999; Potolsky, Cohen, & Saylor, 2003). For example, GPA for some courses was predictive while not for others in the same study. Campbell and Dickson (1996) provided a meta-analysis of nursing research between 1981 and 1990 which examined student success predictions using variables of GPA, the American College Test (ACT), and the Scholastic Aptitude Test (SAT). Quantitative variables most frequently
studied were GPAs for science, liberal arts, pre-nursing, nursing, and college cumulative courses. Although some GPAs were found to correlate with graduation, others did not. One study suggested that chemistry grades could be predictive of graduation and one found a significant result for mathematics. College cumulative GPA, liberal arts GPA, and SAT scores were least predictive (Campbell & Dickson, 1996).

In a pilot study, Glick, McClelland, and Yang (1986) found that the biological science GPA and cumulative pre-nursing GPA were the best predictors for success in the nursing courses. Limiting factors for this retrospective study included small sample size (N = 51) and data electronically drawn from academic records for one graduating class. In a follow up study (Yang, Glick, & McClelland, 1987), the validity of using pre-nursing cumulative GPA to predict nursing program academic achievement was supported. Although still from one school, data were retrieved for students of three graduating classes of BSN students (N = 210). The best predictors for clinical nursing course grades were pre-nursing GPA (r = 0.64), social science GPA (r = 0.58), and biological science GPA (r = 0.54). Chemistry GPA did not correlate significantly with nursing course GPA, as found in the 1986 study. The same research team (McClelland, Yang, & Glick, 1992) again examined the relationship between admission selection variables and completion of basic nursing programs to determine whether success could be predicted at the time of admission. Predictor variables included high school GPA, ACT scores, chemistry GPA, social science course GPA, and pre-nursing cumulative GPA. ACT scores were most predictive of performance on the NCLEX-RN, but pre-nursing cumulative GPA (r = 0.61) was most predictive of academic performance in the nursing program. The cumulative
biology science GPA \((r = 0.52)\) had the next highest correlation coefficient. Multiple regression analyses showed that three independent variables of high school GPA, biology GPA and social science GPA made statistically significant contributions to the total variance when baccalaureate nursing GPA was the measure for academic success and the dependent variable. Strengths for this study included a large sample size \((N = 1,070)\) and exploratory, retrospective data drawn from nine different baccalaureate nursing programs over a four year period. Sample elimination of those students who did not graduate or for which NCLEX-RN scores were unavailable represents a weakness. None of the three studies took timely graduation into account.

Studies specific to associate degree nursing programs and GPA are few and demonstrate some conflicting results. Oliver (1985) found that biology course grades were significantly predictive of performance during the first semester of nursing school; this finding supports use of pre-nursing GPA as a possible predictor of initial success in an associate degree nursing program. However, biology grades were not significant discriminators for successful program completion. Limitations of this \textit{ex post facto} study included small sample size \((N = 67)\), data drawn from a convenience sample in one nursing program, and disregard of timely graduation. Felts’ (1986) findings were consistent with those of Oliver, who found that GPA of support courses and microbiology were found to be significant predictors for the GPA in nursing courses in five associate degree nursing program in one state. Again, timely graduation was not a consideration and data were collected for only those students \((N = 297)\) who wrote the NCLEX-RN. Sayles, Shelton, and Powell (2003) used pre-nursing GPA with nursing course GPAs to
determine if the cumulative GPA at the time of graduation was correlated with passing the NCLEX-RN; as GPA increased, the likelihood of passing the NCLEX-RN increased. However, this is different from predicting timely graduation from the nursing program. GPA at the time of graduation only reflects those who reached the point of graduation. A small sample size (N = 78) and data drawn from one nursing program were limitations in that study.

Similar to the current study, Higgins (2005) examined relationships with pre-requisite course grades and graduation for one associate degree nursing program. Grades in an anatomy and physiology course and microbiology course were linked positively to graduation; however, no significant differences were found for other general education courses in relation to graduation. The convenience sample was drawn from student records (N = 213) and did not measure timely graduation. Additionally, although the terminology of pre-requisite was used, it was unclear as to which courses were pre-program or pre-admission.

It is unknown whether using GPA as an admission criterion for associate degree nursing programs is associated with timely graduation due to the fact that associate degree research is limited and offers conflicting outcomes. Likewise, none of the studies to date has investigated the relationship of pre-admission GPA to timely graduation. Therefore, the current research examined the use of admission GPA, including cumulative GPA and GPA for the nursing program pre-requisite courses, for predicting student progression and timely graduation. The fact that such research is lacking for
associate degree nursing programs despite representing the largest public nursing educational sector in the U.S. reinforced the need for this study.

It is important to note that using outcomes from studies relating pre-admission GPA from baccalaureate pre-licensure programs to graduation is problematic for those interested in associate degree pre-licensure nursing programs. Notable differences exist between baccalaureate and associate degree student populations that could affect research generalizations. Applicable differences relevant to this study can be found in students’ retention and persistence to degree rates between two-year public and four-year public colleges (ACT, 2006; Auerbach, Buerhaus, & Staiger, 2001). For both retention and graduation rates, four-year (BA/BS) college students have higher success rates when compared to associate degree student populations (ACT, 2006). Age and ethnic mix, both of which have been associated with graduation rates, typically vary between associate degree and baccalaureate nursing programs (Shelton, 2003). When compared to baccalaureate students, the associate degree student typically has been out of high school seven or more years, works more hours, and carries a heavier family responsibility burden which can contribute to attrition, reducing graduation rates (Shelton, 2003). Because of these differences, caution is advised when applying baccalaureate pre-licensure nursing outcomes to associate degree student populations.

In summary, it is unknown whether using either cumulative GPA or pre-requisite GPA as a primary admission criterion is associated with or predictive of student progression and timely graduation in associate degree nursing programs. Therefore, this research was designed to address the predictive values of admission cumulative GPA and
pre-requisite GPA for timely graduation from three associate degree nursing programs. Timely graduation was defined as progression through the program without an exit or nursing program attendance interruption. Nursing courses are to be taken in sequential order in designated semesters as identified by the nursing program curriculum. Age and race/ethnicity was also evaluated in relation to GPA and timely graduation of associate degree nursing students. This research did not address relationships of these variables to NCLEX-RN pass rates, as considerable research is available involving predictive variables for NCLEX-RN success. Increasing the number of graduates by using reliable admission criteria predictive of timely program completion may be the only means to increase the number of graduate nurses when all other resources remain constant, preventing increased enrollments. Consequently, the following questions guided this research.

Research Questions

The following research questions were explored in this research.

1. Is pre-admission cumulative GPA predictive of timely graduation of associate degree nursing students?
2. Is pre-requisite course GPA predictive of timely graduation of associate degree nursing students?
3. Is age or race/ethnicity associated with GPA (either pre-requisite GPA or cumulative GPA at the time of admission to the nursing program) and timely graduation of associate degree nursing students?
CHAPTER II

LITERATURE REVIEW

Introduction

Due to the national nursing shortage, colleges have been asked to increase enrollments and graduate more prospective registered nurses (American Association of Colleges of Nursing, n.d.; American Association of Colleges of Nursing, 2005). Strained financial resources, inadequate clinical site availability, state mandated student/faculty ratios at clinical sites, and an inadequate supply of qualified faculty all may limit a nursing program's capacity to increase enrollments (Byrd, Garza, & Nieswiadomy, 1999; Seldomridge & DiBartolo, 2004). When admission slots are at a premium and demand is high, the capabilities of each student should be considered because each admission of an unsuccessful student necessitates denial of a potentially successful candidate (Oliver, 1985). Moreover, inadequate admission slots coupled with a large applicant pool provide the opportunity for nursing programs to be very selective. For that reason, examining relationships between admission criteria and performance is essential so that the students selected for admission have the best probability for program graduation (Newton, Smith, Moore, & Magnan, 2007; Sayles, Shelton, & Powell, 2003; Seldomridge & DiBartolo, 2004). Increasing the number of students who graduate from nursing programs could appreciably increase the number of new registered nurses-entering the workforce. The shorter two-year pathway for associate degree graduates places registered nurses at the...
bedside in half the time it takes for baccalaureate graduates. Consequently, graduating more associate degree nurses could make a significant contribution to reducing the nursing shortage.

Success in a nursing program is defined as both persistence to graduation and the attainment of a predetermined academic performance measured by grades (Shelton, 2003; Tinto, 1993). A quality benchmark for associate degree and baccalaureate nursing programs is for 70–80% of those who enroll to persist to completion or graduation (National League for Nursing Accrediting Commission, 2008; Shelton, 2003). Another student variable of success in a nursing program that can increase the supply of nurses is timely graduation, or to progress through the program without an exit or nursing program attendance interruption. The focus of this study, therefore, was to determine if admission selection strategies that utilize GPA are predictive of timely graduation of associate degree nursing students. Age or race/ethnicity related to GPAs and timely graduation of associate degree nursing students also were explored. The following key concepts related to this research interest were identified to establish descriptors to direct database searches: grades, GPA, grade point average, associate degree nursing program, admission, admission criteria, graduates, nursing education, predicting student performance, nursing shortage, retention, student success, and attrition.

Following identification of these key concepts, a comprehensive literature review was conducted by searching primary and secondary sources. Potential references were retrieved electronically and manually. When articles were not readily available at local libraries, article copies were retrieved from national college library searches by
interlibrary loan with librarian assistance. Primary research articles were obtained for analysis and reviewed for relevance to this research. Electronic or computer searches were carried out by accessing the Educational Resources Information Center (ERIC), Lexis-Nexis, InfoTrac, PsycLit, CINAHL, OVID, and MEDLINE. State and national organizations’ databases were accessed directly for data collection using the internet world wide web. Direct computer electronic journal access was available in some cases using library electronic holdings.

Admission Criteria

Grade Reliability for Measuring Achievement and Learning

The general assumption is that grades reflect learning. It is assumed that the student who receives an A grade is more knowledgeable regarding a particular subject than the student who receives a C grade (Anaya, 1999). Grades, standardized test scores such as the SAT and GRE, and self-reports of learning were all valid measures of learning according to comparisons of data by Anaya (1999). Data were obtained using a survey methodology from a national database of students (N = 2,289) who had taken the GRE in 1989. Undergraduate grades and the GPA composite score are typically viewed by educators as evidence of student learning. Cumulative test score regression results were compared with college GPA regression. Prior scholastic achievement was controlled by entering high school (HS) GPA and SAT Verbal and Math scores. High school grades and SAT scores corresponded with college grades and GRE scores. Statistically significant results were obtained for SAT scores, GRE composite scores and college grade point
averages. The comparison of these data suggests that each appears to be a valid measure of learning.

Anaya (1999) suggested that research generalizability could be put in question as grades were defined as a “non-standardized measure” (p. 500) within colleges and between colleges. This was in agreement with research by Felts (1986), Higgs (1984), and Munday and Hoyt (1965) who suggested that non-standardized grading policies between schools were a limitation when comparing grades. Another major limitation was the selection of the student population from a national sample of students who had taken the GRE. Since the GRE is often taken in preparation for graduate study or for admission to premier colleges, this student population may not be representative of the general college population or associate degree students.

Munday and Hoyt (1965) evaluated ACT and GPA data for 1,510 subjects in the first year of nursing school from seven nursing programs: two diploma hospital based programs, four university schools, and a combined group from two junior colleges. Higher ability was defined by higher American College Test (ACT) scores in English, Math, Social Studies, and Natural Science. However, schools who had the most capable students, as defined by high ACT scores (university nursing programs), did not record the highest grades. These data indicated that generalization of grades from one institution to another should be carried out with caution, particularly when different types of nursing programs are being compared. Moreover, Munday and Hoyt did not differentiate the students according to their program type when interpreting collective student data. This missing information constitutes a major limitation for this study. Students who are weak
academically may have already been eliminated due to attrition or may not have been selected due to competitive admission into university nursing programs that admit students after taking pre-requisite courses in the freshman and sophomore years. The diploma nursing student generally enters the nursing program immediately after high school. It is important to note that these schools were hospital based, not college based. The junior college student is in the nursing program either after acquiring pre-requisite courses or immediately following high school completion, depending on usual admission practices. Therefore, although this collective group of students was described as being in their first year of nursing school, the student sample was not homogenous. Students from each of the programs would be dissimilar from the perspective of preparation and prior academic achievements.

Predicting Minority and Non-traditional Students’ Success Using Grades

Admission criteria using GPA and grades alone may not allow for student selection reflecting a desired diverse student mix. Although these factors may be considered good predictors of future academic performance, individuals from minority backgrounds and older students may be placed at a selection disadvantage when conventional admission criteria are used to evaluate and select applicants. Additionally, past performance is not always suggestive of current ability or motivation to succeed. The student who was not interested in college achievement 15 years ago may be on academic probation due to the past academic record. Upon college re-entry, however, this student could perform consistently above average (Agho, Mosley, & Williams, 1999).
Tracey and Sedlacek (1987) administered The Non-Cognitive Questionnaire (NCQ) to two samples of incoming university freshman (N = 2,122). This instrument was intended to assess the predictability of academic success for White and Black students by examining seven non-cognitive variables, specifically “positive self-concept, realistic self-appraisal, understanding of and ability to deal with racism, preference for long-range goals over short-term or immediate needs, availability of a strong support person, successful leadership experience, and demonstrated community service” (p. 177). Separate stepwise regressions were performed using White and Black students as subsamples. Reliability and construct validity were demonstrated for the instrument. A strong relationship was found between non-cognitive variables, positive self concept and realistic self appraisal, and persistent enrollment for Black students. The questionnaire yielded very little predictive power for Whites related to continued enrollment. The variables were moderately predictive of Black students’ grades. Identification of these non-cognitive predictive variables for minority students suggest that grades alone may not reflect accurate potential for this population.

Agho and colleagues (1999) were interested in the emphasis placed on cognitive (cumulative GPA, foundation course GPA, HS GPA, and standardized test scores) and non-cognitive (goal to increase student diversity, personal goal setting, prior work experience, participation in enrichment programs, performance during personal interview, letters of recommendation, student character, student desire to work in underserved community, extracurricular activities, and history of volunteer work) admission criteria variables and to what extent allied health programs considered diversity in the admission
process. The researchers surveyed accredited baccalaureate allied health programs to determine current admission practices. A total of 206 surveys were mailed and 144 were returned. The participant allied health programs were asked to rank these 14 cognitive and non-cognitive admission criteria according to their perceived importance. Cumulative GPA and GPA for the foundation courses (typically science courses) were selected by all the surveyed allied health programs as top priority when considering applicants. Emphasis was not given to increasing the diversity of student selection; the overall ranking for interest in increasing diversity by allied health programs was tenth.

Agho, Mosley, and Williams (1999) noted that minorities are notably underrepresented in allied health professions according to a 1992 report by the National Commission on Allied Health. Registered nurses made up the largest segment of allied healthcare providers with 2,065,000 members. Of the total employed nurses, 93.5% were women, 8.3% were Black, and 2.9% were Hispanic.

Grade Inflation

Grade inflation is another concern when grades are used for admission criteria. Hadley and Vitale (1985) described grade inflation as a rise in GPA without a rise in student learning. Using grades for admission criteria may present an unreliable indicator for success if grade inflation is occurring. In a non-published doctoral dissertation, Apple (2002) examined grade inflation in eight Tennessee associate degree nursing programs for 1995 and 2000 cohorts (N = 1,256). First, Apple examined cumulative mean nursing admission GPA for 1995 and 2000 cohorts to evaluate the potential for grade inflation for
the courses taken prior to admission to the associate degree nursing program. Findings suggested that grade inflation was not a problem for pre-admission courses for this Tennessee sample. This suggestion was based on the evidence that the mean nursing admission GPAs had not changed significantly from the 1995 classes to the 2000 classes. Apple also examined the potential for grade inflation by studying nursing graduate grades. No significant differences were found for the graduation grades between the classes of 1995 and 2000. Of particular note, this was the only study discovered for potential grade inflation for any nursing program. Admittedly, Apple compared grades within each institution, but not collectively among all schools of nursing because there were variances between admission criteria among the schools. Policies differed related to the approach schools used when calculating cumulative GPA and whether grades from a repeated course would replace the original grade for GPA calculation. Some schools used transfer course grades while other schools only used grades for courses taken at that institution when calculating cumulative GPA. This candid approach to data interpretation would be considered a strength for this study and lends caution to data interpretation for multiple nursing programs, particularly if differences exist for GPA calculations.

A Focus on Retention, Progression, and Graduation

Using Grades to Predict Progression and Graduation

Two primary responsibilities of postsecondary education are to attract students and retain them so they succeed and graduate. Retention is typically associated with traditional measures of college readiness, such as high school GPA, courses completed,
rigor of the high school preparation and curriculum, and evidence of capability by college standardized tests (Robbins, Davenport, Anderson, Kliwer, Ingram, & Smith, 2003; Tinto, 1997). A longitudinal study of 3,450 college students by Ishitani and DesJardins (2002) found that once in college, the higher the student’s first year GPA, the less likely the student was to drop out of college. Students were aged 18–25 who matriculated in private and public four-year colleges within a three-month period. Enrollment status was then followed for these students from 1989 to 1994. Higher family income, higher educational attainment of the student’s mother, personal educational aspirations which included setting goals for higher education, and higher SAT total scores were all statistically significant for predicting reduced risk of dropping out of college. It is important to note that the GPA variable was a measurement for the first year of college only. After the first year, there were no significant differences in the student population related to first year GPA and drop-out rates. Students with low GPAs were probably removed from the sample due to attrition, thus reducing the explanatory power of this variable over time. Research bias is also a concern; those with low GPA who might be most likely to drop out had already done so, leaving only those most likely to complete.

For associate degree nursing students who generally complete pre-requisite coursework during the first year of college attendance prior to admission into a nursing program, it would then logically follow that the pre-requisite GPA or pre-program cumulative GPA would have bearing on the nursing student’s probability for program completion. Hence, a focus of this study was to examine the predictability of using pre-
admission and cumulative GPA for timely graduation of associate degree nursing students.

Other Variables that Impact Graduation Rates

The majority of students who entered U.S. colleges in the 1990s did not graduate (Tinto, 1993). Attrition is not unique to nursing programs, but a serious concern for all institutions of higher education (Angel & Barrera, 1991; Tinto, 1993). The costs of attrition are high for both students and educational institutions. Costs to institutions include financial losses of tuition and fees, loss of faculty lines when enrollments decrease, and increased recruitment costs. Students lose the potential for significant lifetime earnings without a college education (Habley & McClanahan, 2004).

According to a national annual survey of 2,500 two-year and four-year colleges (ACT, 2003), 47% of all community college students drop out between their freshman and sophomore year alone. The National League for Nursing Accrediting Commission (2008) noted better graduation rates for nursing students, however, in both associate and baccalaureate programs for the 2006–2007 academic year. Graduation rates for associate degree nursing programs were 74%; whereas baccalaureate nursing programs had graduation rates of 79% for the same period. These higher graduation rates may have been a result of application of the new National League for Nursing Accrediting Commission definition for graduation, defined as “the number of students who complete the program within 150% of the time of the stated program length” (National League for Nursing Accrediting Commission, 2009). Therefore, if educators are able to predict
success or identify those students most likely to succeed based on admission variables, all concerned benefit. The nursing shortage further warrants the investigation of admission criteria predictive of nursing program success and timely graduation (Lengacher & Keller, 1990).

Sydow and Sandel (1998) explored reasons why students exited one community college before graduation. Information was obtained from withdrawal forms retrospectively to determine reasons for withdrawal. Telephone interviews were also conducted with students who had exited. Descriptive data revealed that 45% of the student withdrawals were in the 20–25 age group. The most significant reasons were found to be conflicts with work and family: 33% of the students cited work conflicts and 32% indicated that they left due to personal or family illness. At this particular college, 85% of the students received financial aid. Therefore, tuition and book expenses were rarely indicated as the reason for exit. Limitations included no reference to academic failures or strength of preparation at the time of student admission. The sample size was not noted. The study subjects were made up of a convenience sample of those students who electively withdrew from classes prior to the end of the 1995 fall semester.

A comprehensive study by Habley and McClanahan (2004) identified student characteristics that placed students at risk for attrition. Letters were sent to Chief Academic Officers at the 2,995 accredited, degree-granting two-year and four-year public and private U.S. colleges to announce the forthcoming survey and for identification of individuals to whom the survey should be sent. The return rate was 35% (N = 1,061). Results were reported using descriptive data. One limitation was that data were provided
by administrators who were asked to rate 20 student characteristics that contribute to attrition according to a five-point response scale: 5 represented a major contribution to attrition; 3 would be considered a moderate contribution to attrition, and 1 equaled no contribution to attrition. The top 11 student characteristics with the greatest contribution to attrition were identified in descending rank as “lack of motivation to succeed, inadequate financial resources, inadequate preparation for college-level work, poor study skills, lack of educational aspirations and goals, too many job demands, socio-economic disadvantage, weak commitment to earn a degree, inadequate personal coping skills, first-generation to attend college, and poor academic integration” (p. 11). The methodology used by the administrators to obtain these data about students who dropped out was not revealed; therefore, it is unknown whether the administrators scored these characteristics according to their subjective opinions regarding attrition at their schools or if students were polled to identify their reasons for leaving the college.

According to Baird (1990), public community college students when compared to baccalaureate students tend to be older, attend part-time, have lower high school grade point averages, have fewer financial resources, work more hours, have more family responsibilities, interact infrequently with other students outside of school, have less peer support, and little involvement in campus activities. These characteristics are consistent with those mentioned by Habley and McClanahan (2004) as high risk for attrition. Mohammadi (1994) cited multiple early studies from the 1970s and 1980s that found that attrition was higher at public community colleges than the rates found at four-year colleges. In longitudinal study, Mohammadi examined independent demographic
variables (age, gender, and ethnic background) and academic variables (cumulative GPA, first semester GPA, hours completed, and credit hours taken per semester) for 3,843 community college students enrolled between fall 1988 and fall 1992. For this population, the following variables were significant predictors of student retention: a) students’ academic goal; b) credit hours taken per semester; c) number of credit hours completed; d) semester GPA; and, e) overall GPA. Age, race and gender were not significant predictors of retention. Attrition rates were found to be higher for females, Black students, part-time students, and for age ranges of 23–35 and 45–50. A limitation for this study was that all data were collected from one rural community college in a southern state. Students were not categorized by programs or academic majors. It is unknown whether these students represented a typical population of community college students in the U.S.; as a result, results may not be generalizable to other community college populations.

Other studies suggest that students from ethnic minorities and foreign-born students who are using English as a second language (ESL) experience higher attrition rates than non-minority English speaking students (Arathuzik & Aber, 1998; Frierson, Malone, & Shelton, 1993; Nibert & Young, 2001). The 1996 U.S. Department of Education report, “A Descriptive Summary of 1992–1993 Bachelor’s Degree Recipients” confirmed that graduation rates for African Americans were generally lower than Caucasian students (Agho et al., 1999). This was consistent with findings by Mohammadi (1994) whose longitudinal study’s descriptive data revealed that attrition of Black students was slightly higher than for White students and other minority groups. More
research is needed for associate degree or community colleges given noted differences between community and baccalaureate college student populations.

Jeffreys (1998) conducted one of the few studies found using an associate degree nursing student population (N = 97). The purposive sample was drawn from a population of students enrolled in an associate degree nursing program at a northeastern U.S. public university. Selected students were enrolled in the first required clinical nursing course. All students who attended this class on the third day were asked to participate, but only 97 of the 142 non-traditional students completed the questionnaires as requested. Non-traditional students, typical of associate degree nursing program populations, were operationalized for this sample as those students who had at least one of the following descriptive factors: age 25 or older, male, English as a second language (ESL), ethnic or racial minority, had dependent children, or held a general equivalency diploma. A measurement tool for self-efficacy and perceptions concerning academic and environmental variables was distributed. A Likert-type 60-item tool was given to examine students’ perceptions of their ability to learn nursing skills. Students rated self-learning and perceived obstacles to learning by answering a 42-item survey instrument that focused on supportive academic and environmental variables perceived to positively influence retention and academic success. Consistent with Metzner and Bean (1987), Jeffreys found that environmental variables, such as family responsibilities, particularly childcare, and family crises were cited most often as severely or moderately impacting both academic achievement and retention. Family emotional support promoted retention. Student peers and friends outside of school supported academic achievement and
retention. Using linear regression analyses, one statistically significant result was obtained: the academic strength score and academic achievement (one nursing course grade) were inversely correlated. Self-efficacy, academic variables, and select environmental variables in combination resulted in a moderate sum of variance in predicting academic achievement. Using multiple regressions, the academic strength variable was statistically significant in predicting academic achievement and retention. A puzzling result was found for a subgroup of students who reported the presence of high academic support while earning significantly lower grades. This outcome could have resulted from a very small sample size in this subgroup or could reflect the inclusion of students who had sought and received assistance due to identified academic weaknesses, although this information was not reported. Levin and Levin (1991) warned that high risk students may not identify academic deficiencies in time to seek assistance and gain the benefits of that assistance. Weaknesses of this study were the small sample size and the lack of information regarding the number of students in each sub-group. No information was provided related to how students were assured that participation or failure to participate in this study would not have any negative impact on evaluation in the nursing course.

Identifying variables that predict student success is an elusive science (Higgs, 1984; Vance & Davidhizar, 1997). Using grade point averages as one component of admission criteria is common practice for nursing programs. However, the association of graduation rates with admission grades was rarely investigated. Moreover, Campbell and Dickson (1996) concluded that previous nursing education research involving admission
criteria and grades for student success prediction has not resulted in consistent findings. Grades and grade point averages continue to be used regularly as criteria for admission, progression, and retention in nursing education. In this integrative meta-analysis of 40 nursing education studies published between 1981 and 1990, Campbell and Dickson (1996) found that GPA was predictive of student success. Cognitive variables most often studied included a variation of GPAs and standardized tests. All of the GPAs demonstrated some significant correlations with graduation. Of the cognitive variables reported as significant for predicting retention, graduation, or NCLEX success, college cumulative GPA was reported in 22 studies, pre-nursing GPA reported in 20, and nursing GPA reported in 20 studies. GPA from biological sciences (n = 6) was found to be predictive of performance in the nursing courses; 67% of these reported occurrences had statistically significant results. GPA for chemistry was studied as a cognitive predictor (n = 5); 80% demonstrated significant results (p < 0.05). These outcomes suggest support for using pre-requisite science course GPA as an admission criterion. Ninety-four percent of the nursing research studies were descriptive and utilized convenience samples. Likewise, Campbell and Dickson (1996) reported findings in descriptive terms only. The authors recommended that comparable institutions should execute collaborative research for better understanding of the relationships of grades and the probability of graduation.

Program specific research to evaluate reliable indicators for student success has been recommended. Nursing faculty should determine the best admission criteria for the student population served by their institution (Vance & Davidhizar, 1997). Research is needed to explore whether characteristics of student populations in associate degree
programs result in similar findings as for baccalaureate degree students, and to
investigate associate degree programs specifically with regard to prior inconsistent
research findings regarding grades and graduation success for baccalaureate and associate
degree students.

Pre-requisite GPAs as Predictors for Graduation in Baccalaureate Research

Most of the research found in the literature on GPA as a predictor of graduation
pertains to baccalaureate students in university settings. Clemence and Brink (1978)
conducted an exploratory descriptive study using a convenience sample at one state
university of 247 baccalaureate nursing graduates between 1971 and 1975. The focus of
the study was to determine if admission GPA, pre-requisite course requirements, or
demographic data affected the terminal criterion of program completion. Graduation was
treated as a dichotomous variable of successful/non-successful. Timely graduation was
implied although the study did not specifically state that students who exited and later
returned to graduate would be excluded. All students entering the school of nursing from
1969 to 1973 formed the sample. Admission GPA was recognized as the most significant
factor in relation to student success. Although frequently referenced in nursing literature,
a grave weakness of this study was the absence of documented statistical findings.
Frequency, central tendency, Pearson’s chi squares and correlation analysis were
mentioned, but no actual numerical results were published. Another weakness was the
discovery that some of the students were somehow allowed admission without
completing the pre-requisite course requirements. It was unclear if these subjects were
removed from the sample. Additionally, the researcher noted that minority students were allowed admission even if they did not meet the minimum 2.8 cumulative GPA requirement; admittedly, the researcher claimed that minority admissions did tend to skew the sample given the fact that minorities constituted 31% of the class. The term “minority” was not defined for the study.

A similar result was obtained by an earlier researcher whose work was published in 1981. Hayes studied baccalaureate nursing program students (N = 290; 62 non-graduates and 228 graduates) in one college to determine predictors for academic success as defined by graduation. The first null hypothesis, which indicated that there would be “no significant difference between graduates and non-graduates based on the regression equation utilizing cognitive variables” (p. 5), was rejected. The results of the regression analysis showed that eight cognitive variables predicted academic success (freshman GPA for both semesters, chemistry grades for two courses, the SAT verbal score, and grades for mathematics, psychology, and philosophy). Hayes concluded that cognitive variables are the best predictors for academic success. The same eight cognitive variables were predictive for two cohorts within one school. Additionally, since these cognitive indicators were based on freshman courses, findings supported early detection of those students unlikely to graduate. Non-cognitive variables made no statistically significant addition to the ability to predict graduation.

Higgs (1984) conducted a study to determine the degree to which admission criteria individually and collectively predicted success in a baccalaureate nursing program. Four convenience samples were selected for analysis from groups of students
who entered the nursing program in 1974 (n = 164), 1975 (n = 166), and 1976 (n = 177). Merged data from all three classes were used to create the final group (n = 507). The study also examined interaction between students’ academics, ethnicity (white/non-white), gender, and age (as dichotomous categorical data, less than or equal to age 22 or greater than age 22), and admission criteria in predicting nursing program success. Correlations of admission data, including prerequisite and cumulative GPA (interval data), were examined with criterion variables of nursing GPA, clinical GPA, and science GPA. The pre-major variable of cumulative GPA was defined as GPA on all college coursework completed prior to application into the upper division nursing major. Prerequisite GPA consisted of the psychosocial and biophysical sciences taken prior to application. Cumulative GPA and pre-requisite GPA demonstrated weak correlations with the criterion variables. Pre-requisite GPA was more correlated with the nursing GPA ($r = 0.40$) and science GPA ($r = 0.31$) than cumulative GPA ($r = 0.32$ and $r = 0.23$ respectively). Stepwise multiple regression analysis was used to determine the relationship among admission criteria and the three criterion variables followed by the interaction among admission and background variables in predicting success in the three criterion variables. Notable findings included that pre-requisite GPA and cumulative GPA were correlated with all three achievement variables and that successful students who progressed without interruption were predicted with 60% accuracy. Students who progressed with interruption were predicted at 61% accuracy.

Higgs’ (1984) results suggest that prediction of progression without exit or course failure has fair predictability. When the reason to withdraw was controlled, analysis
provided more predictability. Unsuccessful students who withdrew following course failures were accurately predicted in 64% of the cases and the successful students were predicted in 69% of the cases giving a total predictive accuracy of 69%. This study has relevance to the current study as pre-major variables have many commonalities. Similar to the current study, Higgs (1984) examined cumulative GPA, pre-requisite GPA, and demographic variables of age, gender, and ethnicity in relation to successful completion or graduation.

A pilot study by Glick, McClelland, and Yang (1986) supported the relationship of GPA with future academic performance. Although a small sample of 51 baccalaureate nursing program graduates was used, data demonstrated that pre-nursing cumulative GPA and biology GPA were highly correlated with performance in nursing courses. The statistically significant correlations supported the validity of using pre-admission GPA as a selection criterion for admission to this baccalaureate nursing program.

Yang, Glick, & McClelland (1987) studied baccalaureate students (N = 210) in one college. Although one focus was predictability of success on the NCLEX-RN licensure examination, the researchers also examined the predictability of the cumulative pre-requisite GPA and grades for other pre-admission courses on nursing program completion. Archived data were collected retrospectively for students who had graduated in the early 1980s. The best predictors for grades in nursing clinical courses were pre-nursing GPA (r = 0.64), biology GPA (r = 0.54) and social science GPA (r = 0.58). These data indicated that successful completion of nursing courses in BSN programs could be predicted at admission. No major limitations for this study were identified except that
data were collected from only one college BSN nursing program. Timely graduation was not discussed. The age of the study is also a limitation related to usefulness for this study.

McClelland et al. (1992) incorporated an investigation of pre-nursing grades as predictors of graduation into a larger study of variables that predicted performance of baccalaureate nursing graduates on the licensure examination. The convenience sample (N = 1,070) included students from nine BSN programs. The results showed that pre-nursing GPA correlated significantly with completion of the BSN curriculum (r = 0.61). The following pre-nursing course grades were correlated significantly with nursing major completion: biological science courses (r = 0.52), social science courses (r = 0.50) and chemistry (r = 0.42). Similarly, high school GPA correlated with the nursing GPA (r = 0.40). Collectively, the pre-nursing GPA (r = 0.61) was the best predictor for nursing course success (i.e., completion) in the nine baccalaureate nursing programs studied by McClelland et al. Weaker (but significant) correlations were demonstrated for the individual courses than the cumulative pre-nursing GPA. Strengths of this study included thorough documentation of findings and data collection in nine baccalaureate nursing programs. Results were reported in aggregate form; variances specific to each school were not reported. Although the primary focus was on NCLEX-RN performance, these secondary data analyses findings are pertinent to this research.

Byrd, Garza, & Nieswiadomy (1999) performed an ex post facto baccalaureate study in one college that focused on admission and progression criteria predictors of success (i.e., graduation) of 278 BSN students. Data were retrieved from student records. Demographic data were collected. Predictor variables included age upon admission,
ethnicity, a prior bachelor's degree, cumulative science GPA, cumulative social science GPA, cumulative pre-nursing GPA, and the grade earned in each nursing course during the first year. If a nursing course was repeated, both grades were recorded. Logistic regression was used to make predictions. Three predictive models were developed for two subsets of students; the first subset included all students and the second included only those students who graduated or failed (drop out students were excluded). The time frames of prediction were a) prediction before enrollment in nursing courses; b) prediction after the first semester, using pre-enrollment grades and grades in the first semester; and, c) prediction after the second semester. The second semester model used pre-enrollment data with grades from the first and second semesters. Before enrollment in the nursing program, variables of age, ethnicity, science GPA, and pre-nursing GPA successfully predicted graduation in 77% of the cases. For those students who had finished the first semester of nursing work, graduation was successfully predicted in 82.6% of the cases by using three variables: age, pre-nursing GPA, and a pharmacology grade. The final model of this group still used age and ethnicity, but added social science GPA and grades on the first medical-surgical course. These four variables predicted graduation for 91% of the students. When drop-out students were excluded, prediction successes increased for each to 88%, 92% and 97% consecutively. Notably, pre-nursing GPA was found to be related to graduation in three predictor models of this study. Nursing course grades were also predictably linked to graduation. However, results should be interpreted with caution. Data were collected from one baccalaureate nursing program. Ethnicity was unevenly distributed and the majority (83%) of the students was
White. Students were allowed to repeat pre-requisite courses to improve their pre-nursing GPA, a factor that may have influenced the GPAs reported for this study. Ideally, the study findings should have taken repetitive courses into account by reporting on both grades. It was unclear whether the grades for the first and second attempts were averaged or if the new grade was used in lieu of the first course attempt.

Potolsky, Cohen, and Saylor (2003) conducted a descriptive, correlation study to explore the association of pre-requisite science course grades and first semester performance in a BSN program. Using a two-tailed Pearson correlation coefficient, positive correlations were noted between pre-requisite science grades and the mean pathophysiology grade ($r = 0.77, p < 0.01$) and pre-requisite science grades and the mean nursing pharmacology grades ($r = 0.60, p < 0.01$). Based on these findings, the authors recommended that the required cumulative GPA for the science courses be set at a B average for admission consideration to reduce attrition. Caution should be used related to generalizability of these findings, however, as the convenience sample was quite small (only 37 students) from one baccalaureate nursing program. The study also focused on the usefulness of tutoring to improve performance in the first semester.

Pre-requisite GPAs as Predictors for Graduation in Associate Degree Programs

Apple (2002) found a significant association between cumulative mean admission GPA and successful completion (graduation) for 14 of 16 cohorts in associate degree nursing programs for years 1995 and 2000 in her non-published dissertation. Data were obtained from eight different associate degree nursing programs in one southern state.
Student data (N = 1,847) were retrieved from existing student records located at each community college. These results were consistent with results from four other studies that examined admission GPA as effective indicators for program completion (Campbell & Dickson, 1996; Clemence & Brink, 1978; McClelland et al., 1992; Yang et al., 1987). Although analyses were descriptive, data clearly demonstrated that as GPA increased, the probability for successful completion also increased. These data are relevant to the current study. Other elements of this research focused on the potential for grade inflation. No major limitations were noted.

Similarly, Felts (1986) studied five associate degree programs in a Mid-western state. The study’s purpose was to determine performance indicators for nursing courses and the NCLEX-RN. The results showed that GPA for support courses (all non-nursing courses required in the nursing program curriculum) and microbiology were significant predictors (p < 0.001) of nursing courses GPA and subsequent program academic success. The GPA for support courses accounted for 46% of the variance in the GPA for nursing courses. The inclusion of microbiology only added 1%. This research did not specifically speak to graduation, although success in the nursing courses suggests progression, which would lead to graduation. No information was linked to timely graduation. The primary focus of this research was to identify predictors for NCLEX-RN success. Although the researcher claimed that data were drawn from five Midwestern associate degree programs, the final sample sizes was small (N = 166). The methodology did not indicate how the students were divided or chosen for samples. Another major limitation was that differences in grading policies and GPA between colleges were not described,
standardized or adjusted as they reflected better grades. These limitations could impact research data generalizability.

Oliver (1985) sought to determine which independent variables effectively predicted academic success in one associate degree nursing program as measured by first quarter GPA and graduation or non-successful program completion. An *ex post facto* design and convenience sample consisted of 67 student records. At that time, most students entered nursing programs immediately following high school graduation, so high school achievement was the academic focus. Biology grades \((p = 0.0081; p < 0.01)\) and high school ranking \((p = 0.0225; p < 0.05)\) were both significant indicators for academic success in the nursing program’s first quarter. Using multiple regression, three variables significantly predicted first quarter GPA \((p < 0.01):\) biology grade \((p = 0.0001);\) age \((0.0014);\) and faculty program completion prediction \((p = 0.0009). A weakness was use of subjective faculty predictions of first quarter GPA and the potential for program completion which the author identified as independent variables. The sample was small and consisted of students from only one associate degree class. The age of the research was also a limitation for application to today’s associate degree programs. This college used high school grades because students were accepted immediately following high school graduation. Of interest, Oliver proposed identification of an admission process that would allow for selection of nursing program candidates with the highest potential for success, reduce attrition, increase graduation rates and increase nursing manpower in the midst of the 1980s nursing shortage.
Lengacher and Keller (1990) found that entrance GPA correlated with the exit GPA for community college associate degree nursing program graduates (n = 146) from one Florida college. Entrance GPA was simply the cumulative GPA at the time of entrance into the nursing program. Exit GPA was the cumulative GPA at the time of nursing program completion or the time of graduation. These findings suggest that entrance GPA could be used for predicting exit GPA or graduation. However, this finding was a minor element of the research focus of predicting success on the NCLEX-RN examination. The major purpose of this study was to identify students at risk for failure of the NCLEX so that remediation could be initiated early to increase the probability for success. No information was presented related to those who did not graduate, nor was timely graduation discussed. Therefore the data did not reflect those who were unsuccessful. Another weakness was the small sample size of only 146 students.

A more recent study (Higgins, 2005) in a large associate degree nursing program evaluated graduation outcomes of 213 students from three cohorts. Ex-post facto data were collected from archived records for students in three cohorts in one college. A convenience sample was used; no attempt for randomization was made from a larger population. All students from three cohorts (fall 1999, spring 2000, and fall 2000) were included. When pre-requisite course grades for two English courses (r = 0.031 and r = 0.035), anatomy and physiology I (r = 0.005), chemistry (r = 0.017), and a general psychology course (r = 0.021) were correlated with completion of the program, no statistically significant differences was found between the courses. However, a statistically significant difference was found in the association between microbiology (r =
0.191) and anatomy and physiology II (r = 0.152) with completion of the nursing program. These reported findings were embedded in the narrative of the research article. Actual analysis results were not illustrated in tables. For the qualitative component of this research, associate degree program directors (N = 15) were asked to identify strategies to increase student retention. These directors were unrelated to the one associate degree program nursing program under study. Two directors had recently increased the required minimum admission GPA from 2.50 to 2.75. A common theme was that the number of times a student could repeat pre-requisite courses should be limited to two, particularly when the higher grade is used for admission evaluation. The results of this study support the findings of Lengacher and Keller (1990) when the entrance GPA correlated with the exit GPA for associate degree students (N = 146). The results of Lengacher and Keller (1990) and Higgins (2005) both suggest that students can be differentiated upon admission related to strength of academic performance in pre-requisite courses, and hence, potential for success in the associate degree program, but they did not study time to graduation.

Summary and Conclusions Drawn from Comprehensive Literature Review

Associate degree nursing programs can play a vital role in educating entry level nurses within a two-year time frame. This is particularly significant during a well documented nursing shortage projected to worsen over the next decade. Although approximately two thirds of all registered nurse graduates enter the profession from associate degree nursing programs, these programs and their students are not well
represented in the literature. The literature identified differences between typical associate degree student populations compared to baccalaureate nursing students (Shelton, 2003). Therefore, caution is advised when generalizing baccalaureate data to associate degree student populations. Moreover, research specific to associate degree student populations and nursing program outcomes is needed to add to the body of knowledge for associate degree education.

Only four pieces of published research were found for associate degree nursing programs that addressed GPA and nursing program completion. The research in two of the studies was conducted over 20 years ago (Felts, 1986; Oliver, 1985). Sample sizes for all four of the associate degree investigations were small; the mean was 148. One researcher (Oliver, 1985) noted that most students were admitted to the nursing program directly out of high school which would create a student population atypical to the students at community college today. The focus of the studies conducted by Lengacher and Keller (1990) and Felts (1986) was actually on predicting NCLEX success; the relationship of admission grades and nursing course success was a side note for both studies. Only one researcher (Higgins, 2005) explored an associate degree nursing program student population in the past decade. A noteworthy gap in the literature exists for associate degree nursing programs specific to the predictability of admission criteria for program progression to graduation.

The literature demonstrated that, although grades were viewed as a measure of learning and academic ability, potential limitations exist when making generalizations related to grades. The literature clearly alleged that grades were a non-standardized
measurement (Anaya, 1999; Felts, 1986; Higgs, 1984; Munday & Hoyt, 1965). Concerns abound regarding the reliability of grades when evaluating a mixed student population; abilities may not be accurately reflected by grades for different student populations, such as minorities. Nevertheless, grades are still frequently used as an admission criterion for nursing student selection (Agho et al., 1999).

Although not in the scope of this research, the literature also identified multiple other reasons for failure to graduate from college. Factors such as motivation, financial resources, goal setting, and family support may also influence success or failure in the associate degree student population (Baird, 1990; Habley & McClanahan, 2004; Mohammadi, 1994; Sydow & Sandel, 1998). However, in the midst of normal variances in student populations, the identification of key variables that could be highly predictive of program success and graduation would be beneficial when considering program admissions. Ideally, application data and criteria used for student selection should reliably identify students who have the propensity for successful completion and competency to become successful health care providers. Consequently, examining the relationships among admission criterion variables and nursing program student performance is vital if nursing programs are interested in selecting students with the highest possibility of completing the typically rigorous nursing curriculum (Fowles, 1992; Gallagher, Bomba, & Crane, 2001; Seldomridge & DiBartolo, 2004).

Gaps in the literature were evident based on the literature review. Most of the studies were completed in the 1980s and 90s, making them already more than a decade old. It is unknown whether findings from these students could be applicable and
generalizable to current associate degree nursing student populations. Furthermore, the majority of the studies involved baccalaureate nursing programs reflecting a gap in associate degree research. When associate degree research was found, the sample sizes were generally small and studies relied heavily on descriptive data.

Examining relationships between admission criteria and performance is essential so that students selected for admission have the best probability for program graduation (Newton, Smith, Moore, & Magnan, 2007; Sayles, Shelton, & Powell, 2003; Seldomridge & DiBartolo, 2004). This is particularly important when meager fiscal resources and inadequate clinical space for students may limit the possibility of enrollment increases at community college associate degree nursing programs. Consequently, the current study has the potential to contribute to the scientific body of nursing education knowledge. The goal was to determine if selective admission criteria based on pre-requisite and cumulative GPA can contribute to higher timely graduation rates for associate degree nursing students. Higher timely graduation rates would increase the number of potential registered nurses annually at a time when the nation is entrenched in a nursing shortage that threatens the quality of healthcare delivery. Additionally, these results should provide valuable information for nursing program administrators and their respective colleges or universities to determine if selective admissions which use cumulative and pre-requisite GPA are worth the investment of time and labor costs necessary to implement these admission criteria.
CHAPTER III

METHODS

Introduction and Purpose

Chapter III begins with a restatement of the purpose and the research questions. The chapter then includes descriptions of the three participating community colleges with inclusionary and exclusionary criteria for student record selection. Operational definitions are provided for key variables. Research procedures, including methods of data collection, location of data collection and duration of the study are described. The chapter ends with a brief description of procedures used for data analyses.

Purpose

The purpose of this study was to determine whether cumulative or pre-requisite GPA is predictive of timely graduation from associate degree nursing programs. Age and race/ethnicity of associate degree nursing students also were explored in relation to timely graduation and for potential interactions with GPA.

Research Questions

The following research questions were explored in this research.

1. Is pre-admission cumulative GPA predictive of timely graduation of associate degree nursing students?
2. Is pre-requisite course GPA predictive of timely graduation of associate degree nursing students?

3. Is age or race/ethnicity associated with GPA (either pre-requisite GPA or cumulative GPA at the time of admission to the nursing program) and timely graduation of associate degree nursing students?

Participating Colleges

Three community college associate degree nursing programs in one Midwestern state provided de-identified student data for this study. These colleges are two-year public community colleges that offer associate degrees, certificates, and a wide range of continuing education programs. College A (n = 141) serves over 7,000 credit and non-credit students annually. College B (N = 158) is the smallest of the three colleges with enrollments of less than 3,000. College C (n = 138) is the largest of the three two-year public institutions, serving approximately 13,000 students each semester. All three colleges provide associate degree education to prepare graduates for immediate employment. Each of the community colleges offers degrees in business, healthcare, human and public services, technical occupations, and industry. Similarly, each college provides students with the choice of degree program completion or the opportunity to earn general education credits which are transferrable to four year universities. Student populations in each college were similar for race/ethnicity and reflected demographic characteristics of the state they served.
Each associate degree nursing program required four semesters of nursing courses or approximately two academic years of coursework. The core curriculum of all three schools was similar in that each school had coursework in the primary focus areas of nursing skill building, pediatric, obstetrical, women's health, medical-surgical nursing, and nursing roles and ethics. All schools required specific nursing courses and general education courses to meet graduation requirements. Colleges A and B clearly identified explicit courses required for graduation; the student did not have individual or alternate course choices. However, College C allowed the student to pick from multiple courses in subject classifications to meet the core curriculum requirements under the general education category.

All of the schools prepared students to take the NCLEX-RN upon graduation. Graduates from all three nursing programs earned an Associate Degree in Applied Science. All three schools met state regulations for administration of an associate degree nursing program. However, only College A was accredited by the National League for Nursing Accrediting Commission, Inc.

Although each participating associate degree nursing program had similar admission and grading criteria, there were differences between the three programs’ admission criteria and grading practices. These differences were noted for program pre-requisites, grading ranges, and the minimum required cumulative GPA at the time of admission.

None of the nursing programs in the study were using GPA ranking as a competitive admission criterion during the sampling period. They did, however, identify
the minimum cumulative GPA allowed for admission. Colleges A and B required a minimum cumulative GPA of 2.5 on a 4.0 scale. College C allowed admission of students with a cumulative pre-admission GPA of 2.0 or higher.

Study Design and Research Procedures

This study was designed as a retrospective archived record review of existing de-identified student data to maintain confidentiality and anonymity for students and their corresponding nursing programs. No actual student participation or contact was implemented. The term, de-identified data, refers to original data that have been stripped of all elements that might enable a reasonably informed and determined person to deduce the identity of the subjects. A unique number was created for each student that identified students with participating colleges and the time of nursing program admission; the participating college maintained the key to assure anonymity and confidentiality. Any later reference to that student data set was made by use of this unique number.

Two nursing program cohorts for each of the three participating colleges were used in this research. A cohort was defined as a group of students that started with semester one of the required nursing program curriculum with progress tracked within the cohort for four semesters (2 years), noting those who graduated in that time frame and those who did not. College A’s first cohort began coursework in fall 2003 and the second cohort entered the nursing program in fall 2004. The first cohort for Colleges B and C comprised two small combined groups of students who started in fall 2003 and winter
2004. The second cohort for Colleges B and C comprised students who began the nursing program in fall 2004 and winter 2005.

Basic assumptions were determined to be applicable to this research. First, transcripts are considered a legal document and can be trusted to accurately represent the grades earned by students. It was also assumed that grades reflect students' performance and ability. No attempt was made to evaluate for grade inflation, to identify course content variances between colleges or for equivalent classes taught by different teachers. If a course from another college was accepted by the participant college as equivalent to a required nursing curriculum course and that course was used to meet required graduation credit, the researcher accepted the earned grade as equivalent and representative of the equivalent course. Finally, faculty variables of academic qualifications, clinical experience, teaching experience, and student evaluative methodologies were not considered. It is assumed that all faculty members were qualified to teach and evaluate students as defined by each participating college.

Procedures for data collection were approved by the Human Subjects Institutional Review Board (HSIRB) at Western Michigan University. Administrative approval was obtained from each participating college to allow data retrieval before any data were obtained. To assure reliability in data collection, the researcher met with each of the College Directors and/or designees to assure understanding of the approved research guidelines and the desired data required for this research.
Inclusion/Exclusion Criteria

Inclusion/exclusion data criteria were clearly defined for each participating college. The guidelines specified the following: a) only student records for the designated years of attendance were retrieved; b) only associate degree nursing students’ data were used; c) readmission students were not included in the data set (all students were starting the nursing program for the first time at that college); d) students who already were licensed as Practical Nurses (LPN) were excluded; e) the data were collected for all students who met the inclusion criteria enrolled during the designated cohort periods; and, f) as academic records include birth dates and race/ethnicity information, these data were retrieved. No other personal data such as medical or health records, disciplinary action documentation, or other non-academic related information were accessed.

Information Retrieved from Participating Colleges

The colleges each provided the researcher with a list of pre-requisite requirements for admission, a list of the core nursing program curriculum classes required for graduation, grade ranges used at their college for the nursing program and general education courses, and some descriptive information about the college. General education courses are those required by the college nursing program to meet graduation and degree requirements. These courses become a part of the required nursing program curriculum, but they are not the same as core nursing courses. Examples are broad categories of courses, such as composition, humanities, mathematics, social science, and biological science. The core nursing courses are those identified by the nursing program as nursing
content specific and are generally identified by a course prefix specific to the same, such as NURS.

Data from Student Records

Participating colleges assisted the researcher in collecting the following data for all qualified students: a) birth dates; b) grades for all core nursing program curriculum courses taken at the participating college, including those transferred in for graduation credit; c) race/ethnicity information as reported by the students; d) gender; and e) the graduation or program exit date. The focus of this research was on timely graduation. This was defined as progression through the program’s required curriculum in sequential order without interruption or exit during the usual allotted time for completion of all required coursework. This measurement started with the first semester the nursing student was formally admitted into the college’s nursing program and concluded with the final required course in the program when the status of “graduate” was conferred. Timely graduation rates for this study were measured by the percentage of students that completed the nursing program in the defined time period without exit from the original cohort. Cohort was defined as a group of students that started together with semester one of the required nursing program curriculum. Two cohorts were identified for each College as noted earlier.
Location and Duration of Data Collection

Data collection was accomplished on site at each associate degree nursing program at the main campus of College A, B, and C by the nursing directors or designees. Data collection was carried out for approximately four months, from July through October 2009.

Data Security

The following procedures were used to maintain data security throughout the research process. The colleges provided only de-identified data to the researcher as previously described. Only the nursing director could cross reference actual students’ identities with the researcher’s coded student list. During the time period of the research, paper copies of the de-identified student data were kept in a locked cabinet within the researcher’s locked office. Upon completion of the research, the transcript paper copies were shredded. College C requested that this shredded material be returned for disposal, while Colleges A and B allowed disposal of these papers by the researcher. Upon completion of the data analysis, electronic copies of all data records were placed on a CD which is housed in the locked office of the university faculty advisor.

Measures

All participating colleges used a letter grading system based on a 4.0 quality-point scale. Colleges A and B used the following grade ranges for general education courses: 90–100% = A; B = 80–89%; C = 70–79%; D = 60–69%; and F = 0–59%. Grade ranges
for general education courses were determined by faculty preference at College C; i.e.,
teachers had the academic freedom to define the course grading scales, so the potential
for variation in grading ranges existed for any general education course. Letter grades
corresponded with a designated number of quality points awarded per semester credit
hour completed or earned by the student. The points were allocated as follows: A = 4.0; B
= 3.0; C = 2.0; D = 1.0; and F = 0.0. For this research, only whole numbers were used for
grades. For example, A, A+ or A− were not differentiated. All A grades were listed as A =
4.0. When grades were listed as combination grades such as BA, CB, etc., the lowest
letter grade was the recorded grade. Therefore, a CB grade was equal to a C. None of the
three nursing schools in this study used combination grades; however, a student could
have received a transfer equivalent course grade which utilized this combination grade
designation.

Grade ranges for nursing courses varied slightly. See Table 1 for these variations:

<table>
<thead>
<tr>
<th>Letter Grades</th>
<th>College A</th>
<th>College B</th>
<th>College C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>92–100%</td>
<td>85–91%</td>
<td>78–84%</td>
</tr>
<tr>
<td>B</td>
<td>85–91%</td>
<td>84–90%</td>
<td>78–83%</td>
</tr>
<tr>
<td>C</td>
<td>78–84%</td>
<td>78–83%</td>
<td>*0–77%</td>
</tr>
</tbody>
</table>

*Grades less than a C are considered “failing” for Nursing Programs above.

Grading differences also existed across colleges related to recording of grades for
didactic and clinical courses. College A and C reported grades for didactic courses only. A
failure in a clinical component resulted in a failure for the entire course and was reflected in the didactic grade only. College B used grades for both the clinical and didactic components of the nursing courses. The two grades were averaged and a single grade was given for each of the didactic nursing courses to correspond to the single grade awarded in Colleges A and C.

Pre-requisite courses are those identified by each college as required before admission to the nursing program. College A acknowledged five pre-requisite course requirements: general biology, general chemistry, human anatomy, medical terminology, and an introductory computer course. Math and algebra proficiency were defined by tests instead of required college math courses. Colleges B and C each required seven pre-requisite courses. College B pre-requisite courses included general chemistry, human anatomy, human growth and development, algebra, physiology, general psychology, and a communication course. College C courses included general biology, a combined human and anatomy course, medical terminology, one of two college writing courses, one of two microbiology courses, and a math pre-requisite. Pre-requisite GPA was calculated for each student by the researcher. Pre-requisite GPA is the average calculated by dividing the total number of quality points earned by the total number of semester credit hours attempted for the pre-requisite courses.

Cumulative GPA was also calculated by the researcher for each student. Cumulative GPA is the average calculated by dividing the total number of quality points earned by the total number of semester credit hours attempted. For this research, cumulative GPA was calculated for courses taken prior to admission to the nursing
program, including the pre-requisite courses and other general education courses as required by the nursing program. When grades for required general education courses were transferred from another college, those grades were also recorded when available.

Analysis

Descriptive statistics were used to describe the sample in terms of the entire sample (N = 437) and its components of cohort and college. Variables of age, gender, race/ethnicity, timely graduation (Y/N), and graduation (Y/N) were described as they related to cohorts and colleges. ANOVA was used to determine if there were statistically significant differences for mean age between the colleges. Race/ethnicity data was evaluated by college, compared to state population averages, and described in relation to the entire sample. Pearson chi-square tests were used to determine association of race/ethnicity with timely graduation. Descriptive statistics were used to describe pre-requisite and cumulative GPA. The plan involved first testing the GPA test results. If they were not normally distributed, a Kruskal-Wallis test was conducted followed by the Jonckheere-Terpstra Test to determine if there was a difference in the ordered pattern for Colleges A, B, and C. Pearson chi-square was used to test for association of college and timely graduation. Post hoc tests were used to determine if there were statistically significant differences between colleges for timely graduation.

Age was explored in relation to pre-requisite and cumulative GPA. The associations of gender and cohort were also examined in relationship to age, GPA, and timely graduation. Differences were explored using Pearson chi-square.
Binary logistic regression was used to analyze the predictability of cumulative and pre-requisite GPA at the time of admission for timely graduation to answer research questions one and two. Lastly, binary logistic regression was performed to determine if key variables of age, race/ethnicity, cumulative GPA, and pre-requisite GPA were associated with timely graduation to answer research question three.
CHAPTER IV

RESULTS

Introduction

This chapter describes and summarizes the statistical analyses used to evaluate the research questions established in the previous chapters as follows: 1) Is pre-admission cumulative GPA predictive of timely graduation of associate degree nursing students? 2) Is pre-requisite course GPA predictive of timely graduation of associate degree nursing students? 3) Is age or race/ethnicity associated with GPA (either pre-requisite GPA or cumulative GPA at the time of admission to the nursing program) and timely graduation of associate degree nursing students?

The study sample comprised 437 students from three nursing schools (Colleges A, B, and C). The three colleges are located in one Midwestern state. Baseline descriptive statistics for the variables of gender, age, cohorts, timely graduation, and graduation are found in Table 2. This table depicts the composite data for all students in this sample.

Key variables derived from the research questions are pre-requisite and cumulative GPA, timely graduation, age and race/ethnicity; therefore, these variables were explored first by descriptive statistics followed by inferential statistics to answer each of the three research questions. Comparisons were also made between the three nursing schools to explore if differences existed in any associations by college and, if so, if there was evidence of confounding.
Table 2
Sample Descriptive Statistics (N = 437) for Key Study Variables

<table>
<thead>
<tr>
<th></th>
<th>Number of Students</th>
<th>% of Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>73</td>
<td>16.7</td>
</tr>
<tr>
<td>Female</td>
<td>364</td>
<td>83.3</td>
</tr>
<tr>
<td><strong>Colleges</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>College A</td>
<td>141</td>
<td>32.3</td>
</tr>
<tr>
<td>College B</td>
<td>158</td>
<td>36.2</td>
</tr>
<tr>
<td>College C</td>
<td>138</td>
<td>31.5</td>
</tr>
<tr>
<td><strong>Age at Admission</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–24</td>
<td>143</td>
<td>32.7</td>
</tr>
<tr>
<td>25–34</td>
<td>163</td>
<td>37.3</td>
</tr>
<tr>
<td>35+</td>
<td>131</td>
<td>30.0</td>
</tr>
<tr>
<td><strong>Cohorts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohort 1*</td>
<td>204</td>
<td>46.7</td>
</tr>
<tr>
<td>Cohort 2**</td>
<td>233</td>
<td>53.3</td>
</tr>
<tr>
<td><strong>Timely Graduation</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>194</td>
<td>44.4</td>
</tr>
<tr>
<td>No</td>
<td>243</td>
<td>55.6</td>
</tr>
<tr>
<td><strong>Graduated</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>255</td>
<td>58.4</td>
</tr>
<tr>
<td>No</td>
<td>182</td>
<td>41.6</td>
</tr>
</tbody>
</table>

*Start date Fall 2003 in colleges A, B, and C; **Start date Fall 2004 in colleges A, B, and C; ***Timely graduation: progression through the program’s required curriculum in sequential order without interruption or exit during the usual allotted time for completion of all required coursework.

Females constituted the largest segment of this nursing student sample (83%) overall and for each college. College B had the largest female population (86%) followed by College C (84%) and College A (79%). However, Pearson chi-square indicated that these differences between colleges were not statistically significant (N = 437; Pearson chi-square = 2.448; p = 0.294; df = 2).
Mean age at the time of admission for the total sample and for each college is shown in Table 3. The students' mean age upon admission ranged from 29.8 to 31.9 with a minimum of 18 and maximum of 56 years of age.

Table 3

<table>
<thead>
<tr>
<th>Age at Admission, by College</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td><strong>College A</strong></td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td><strong>College B</strong></td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td><strong>College C</strong></td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
<tr>
<td>Range</td>
</tr>
</tbody>
</table>

One-way analysis of variance (ANOVA) was conducted to determine if there were statistically significant differences for mean age between the three colleges. An alpha level of 0.05 was used throughout for all analyses. The result revealed that there were no statistically significant differences in the mean scores of age among the three colleges for this sample, $F (2, 434) = 2.41, p = 0.091$.

Self-reported race/ethnicity sample data were compared with population averages for the Midwestern state where all three colleges are located (Table 4). The distribution by race/ethnicity for this sample was similar to the state average. Table 4 illustrates that White, non-Hispanic students represented the largest student group for this sample and
the state. Likewise, Black, non-Hispanic students constituted the second largest student group collectively for both this sample and the state.

Table 4
Race/Ethnicity of Sample and State (2008)

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>% of Total Sample</th>
<th>% of State*</th>
</tr>
</thead>
<tbody>
<tr>
<td>White, non-Hispanic (W)</td>
<td>338</td>
<td>77.3</td>
<td>77.5</td>
</tr>
<tr>
<td>Black, non-Hispanic (B)</td>
<td>58</td>
<td>13.3</td>
<td>14.2</td>
</tr>
<tr>
<td>Hispanic (H)</td>
<td>13</td>
<td>3.0</td>
<td>4.1</td>
</tr>
<tr>
<td>Asian/Pacific Islander (A/PI)</td>
<td>13</td>
<td>3.0</td>
<td>2.4</td>
</tr>
<tr>
<td>Native American (NA)</td>
<td>0</td>
<td>0</td>
<td>0.3</td>
</tr>
<tr>
<td>No Response/Unknown (NR)**</td>
<td>12</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>Multi-ethnic/racial (M)</td>
<td>3</td>
<td>0.7</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**These data for students who did not declare Race/Ethnicity are recorded as “No Response/Unknown (NR).”

Table 5 depicts race/ethnicity results by the three colleges. Table 5 illustrates that White, non-Hispanic students constituted the largest group for all three schools. College A had a higher percentage of Black, non-Hispanic students (25.4%) as compared to College B (9.5%) and C (5.1%). This difference in the percent of the colleges’ sample populations that were Black, non-Hispanic versus other race/ethnicities was statistically significant between colleges (N = 437; Pearson chi-square = 28.43; p = 0.0001; df = 2).
Table 5

Race/Ethnicity, by College

<table>
<thead>
<tr>
<th></th>
<th>W (%)</th>
<th>B (%)</th>
<th>H (%)</th>
<th>A/PI (%)</th>
<th>NR (%)</th>
<th>M (%)</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>College A</td>
<td>90 (64)</td>
<td>36 (25)</td>
<td>4 (3)</td>
<td>10 (7)</td>
<td>0 (0)</td>
<td>1 (1)</td>
<td>141 (100)</td>
</tr>
<tr>
<td>College B</td>
<td>133 (84)</td>
<td>15 (10)</td>
<td>3 (2)</td>
<td>3 (2)</td>
<td>2 (1)</td>
<td>2 (1)</td>
<td>158 (100)</td>
</tr>
<tr>
<td>College C</td>
<td>115 (83)</td>
<td>7 (5)</td>
<td>6 (4)</td>
<td>1 (1)</td>
<td>9 (7)</td>
<td>0 (0)</td>
<td>138 (100)</td>
</tr>
</tbody>
</table>

W = White, non-Hispanic; B = Black, non-Hispanic; H = Hispanic; A/PI = Asian/Pacific Islander; NR = No response/Unknown; M = Multi-racial.

Pre-requisite GPA and cumulative GPA were compared for each school of nursing in Table 6. College A students had the highest mean and median pre-requisite GPA ($M = 3.48$; median = 3.71) and cumulative GPA ($M = 3.44$; median = 3.46) at the time of admission. College C students had the lowest mean and median pre-requisite ($M = 3.06$; median = 3.00) and cumulative GPA ($M = 3.09$; median = 3.04). Means, medians, and standard deviations are listed for the total sample ($N = 437$) and for colleges A, B, and C (see Table 6). In all cases, GPA scores were clustered at the higher end of grade distributions, leading to a negative skew. When pre-requisite and cumulative grade ranges were examined for each college and the total sample, the majority of student grades were in the B to A range for all the college samples and the total sample. College C had the lowest pre-requisite (1.84) and cumulative GPA (2.08) scores. The highest admission pre-requisite and cumulative GPA was 4.0 for all colleges. Because the sample results were not normally distributed, a Kruskal-Wallis test was conducted followed by the Jonckheere-Terpstra Test to determine if there was a difference in the ordered pattern for GPA by Colleges A, B, and C. Cumulative GPA $H(2) = 31.18$ and pre-requisite GPA $H(2) = 62$. 
= 39.02 were significantly different by college. Jonckheere’s test revealed a statistically significant trend in the data: for progression from College A to B to C, the median decreased for cumulative GPA $J = 437, z = -5.72$ and pre-requisite GPA, $J = 437, z = -6.43$. The results were statistically significant for both pre-requisite ($p \leq 0.0001$) and cumulative GPA ($p \leq 0.0001$).

Table 6

Admission Pre-requisite and Cumulative GPA for the Colleges

<table>
<thead>
<tr>
<th></th>
<th>TOTAL</th>
<th>College A</th>
<th>College B</th>
<th>College C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-requisite GPA at Time of Admission to Nursing School</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>3.27</td>
<td>3.48</td>
<td>3.26</td>
<td>3.06</td>
</tr>
<tr>
<td>Median</td>
<td>3.33</td>
<td>3.71</td>
<td>3.22</td>
<td>3.00</td>
</tr>
<tr>
<td>N</td>
<td>437</td>
<td>141</td>
<td>158</td>
<td>138</td>
</tr>
<tr>
<td>SD</td>
<td>0.56</td>
<td>0.52</td>
<td>0.47</td>
<td>0.60</td>
</tr>
<tr>
<td>Lowest</td>
<td>1.84</td>
<td>2.10</td>
<td>2.33</td>
<td>1.84</td>
</tr>
<tr>
<td>Highest</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
</tbody>
</table>

| **Cumulative GPA at Time of Admission to Nursing School** |       |           |           |           |
| Mean                 | 3.27  | 3.44      | 3.28      | 3.09      |
| Median               | 3.29  | 3.46      | 3.28      | 3.05      |
| N                    | 437   | 141       | 158       | 138       |
| SD                   | 0.50  | 0.45      | 0.43      | 0.55      |
| Lowest               | 2.08  | 2.13      | 2.27      | 2.08      |
| Highest              | 4.00  | 4.00      | 4.00      | 4.00      |

Timely graduation was the outcome variable in this research. Table 7 displays timely graduation rates for Colleges A, B, and C. Less than half of the total sample students graduated on time ($n = 194; 44\%$). College B had a higher percentage of students who did not graduate on time (71\%) as compared to College A (46\%) and College C
Pearson chi-square results indicated that this difference was statistically significant (N = 437; \( p \leq 0.0001 \); df = 2). Post hoc tests indicated a statistically significant difference for timely graduation between Colleges A and B (\( p \leq 0.0001 \)) and Colleges B and C (\( p \leq 0.0001 \)). No statistically significant difference was noted for timely graduation between Colleges A and C (\( p = 0.988 \)).

Table 7

<table>
<thead>
<tr>
<th></th>
<th>College A</th>
<th>College B</th>
<th>College C</th>
<th>TOTALS (% of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timely Graduation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES (On time)</td>
<td>76 (54%)</td>
<td>46 (29%)</td>
<td>72 (52%)</td>
<td>194 (44%)</td>
</tr>
<tr>
<td>NO (Not on time)</td>
<td>65 (46%)</td>
<td>112 (71%)</td>
<td>66 (48%)</td>
<td>243 (56%)</td>
</tr>
</tbody>
</table>

Race/ethnicity was also examined in relation to on-time graduation. A Pearson chi-square test was used to determine if race/ethnicity was related to timely graduation (Y/N). Results indicated that race/ethnicity and timely graduation were independent of each other (N = 437; \( p = 0.150 \); df = 5). Because Asian/Pacific Islander, American Indiana/Alaskan, No Response/Unknown, and Mixed Race/ethnicity accounted for only 3% of the total sample population, a Pearson chi-square was again executed using five groups for analysis: White, non-Hispanic; Black, non-Hispanic; Hispanic, Asian/Pacific Islander, and Other. Race/ethnicity and timely graduation remained independent of each other (N = 437; \( p = 0.169 \); df = 4). Table 8 depicts timely graduation by race/ethnicity:
<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>( Y )</th>
<th>( N )</th>
<th>TOTAL (100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White, non-Hispanic</td>
<td>146 (43%)</td>
<td>192 (57%)</td>
<td>338</td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>30 (52%)</td>
<td>28 (48%)</td>
<td>58</td>
</tr>
<tr>
<td>Hispanic</td>
<td>9 (69%)</td>
<td>4 (31%)</td>
<td>13</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>4 (31%)</td>
<td>9 (69%)</td>
<td>13</td>
</tr>
<tr>
<td>Other</td>
<td>5 (33%)</td>
<td>10 (67%)</td>
<td>15</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>194</strong></td>
<td><strong>243</strong></td>
<td><strong>437</strong></td>
</tr>
</tbody>
</table>

The association of both pre-requisite and cumulative GPA (both variables categorized into four groups) with on-time graduation was evaluated (Table 9). The whole number represents the total number of students; this number is followed by the percentage of students in each grade range that either graduated on time (YES) or did not graduate on time (NO). Pearson chi-square tests were not statistically significant for timely graduation and cumulative GPA (\( N = 437; p = 0.496; \text{df} = 3 \)) or timely graduation and pre-requisite GPA (\( N = 437; p = 0.415; \text{df} = 3 \)).
Table 9
On-Time Graduation, by Pre-requisite and Cumulative GPA

<table>
<thead>
<tr>
<th>Timely Graduation?</th>
<th>Cumulative GPA Ranges at Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.50–2.50</td>
</tr>
<tr>
<td>YES</td>
<td>14 (50%)</td>
</tr>
<tr>
<td>NO</td>
<td>14 (50%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-requisite GPA Ranges at Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.50–2.50</td>
</tr>
<tr>
<td>YES</td>
</tr>
<tr>
<td>NO</td>
</tr>
</tbody>
</table>

Table 10 depicts the relationships of age and cumulative and pre-requisite GPA.
Cumulative and pre-requisite GPAs were found to differ by age. For the total sample (N = 437), at the time of admission, 143 students were in the age range of 18–24, 163 students were in the range of 24–34, and the remaining 131 students were 35 years old or older. As age increased, the students were more likely to acquire higher cumulative and pre-requisite GPA scores. For the age group of 35 or older, 45% earned a cumulative GPA of 3.5–4.0 and 50% earned a pre-requisite GPA of 3.5–4.0. Using the categorical age and GPA ranges found in Table 10, Pearson chi-square results indicated a statistically significant association of age with cumulative (df = 6; \( p = 0.002 \)) and pre-requisite (df = 6; \( p = 0.019 \)) GPA.
Table 10
Pre-requisite and Cumulative GPA Ranges at Admission Related to Age at Admission

<table>
<thead>
<tr>
<th>Cumulative GPA Ranges at Admission</th>
<th>1.50–2.50</th>
<th>2.501–3.0</th>
<th>3.01–3.5</th>
<th>3.501–4.0</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–24</td>
<td>9 (6%)</td>
<td>44 (31%)</td>
<td>52 (36%)</td>
<td>38 (27%)</td>
<td>143 (100%)</td>
</tr>
<tr>
<td>25–34</td>
<td>6(4%)</td>
<td>51 (31%)</td>
<td>48 (29%)</td>
<td>58 (36%)</td>
<td>163 (100%)</td>
</tr>
<tr>
<td>35 and &gt;</td>
<td>13 (10%)</td>
<td>21 (16%)</td>
<td>38 (29%)</td>
<td>59 (45%)</td>
<td>131 (100%)</td>
</tr>
<tr>
<td>TOTALS</td>
<td>28</td>
<td>116</td>
<td>138</td>
<td>155</td>
<td>437 (100%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-requisite GPA Ranges at Admission</th>
<th>1.50–2.50</th>
<th>2.501–3.0</th>
<th>3.01–3.5</th>
<th>3.501–4.0</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–24</td>
<td>14 (10%)</td>
<td>45 (32%)</td>
<td>41 (38%)</td>
<td>43 (25%)</td>
<td>143 (100%)</td>
</tr>
<tr>
<td>25–34</td>
<td>12 (7%)</td>
<td>49 (30%)</td>
<td>40 (25%)</td>
<td>62 (38%)</td>
<td>163 (100%)</td>
</tr>
<tr>
<td>35 and &gt;</td>
<td>15 (11%)</td>
<td>24 (18%)</td>
<td>27 (21%)</td>
<td>65 (50%)</td>
<td>131 (100%)</td>
</tr>
<tr>
<td>TOTALS</td>
<td>41</td>
<td>118</td>
<td>108</td>
<td>170</td>
<td>437 (100%)</td>
</tr>
</tbody>
</table>

The associations of gender and cohort with GPA were examined. No statistically significant differences were found between the groups for either pre-requisite or cumulative GPA by gender. Although males appeared to have a slightly higher pre-requisite GPA ($M = 3.274$, SE = 0.066) than females ($M = 3.265$, SE = 0.029), the difference was not statistically significant as shown in the ANOVA results ($p = 0.894$; df = 1). Likewise, cumulative GPA for females ($M = 3.270$, SE = 0.026) and males ($M = 3.264$, SE = 0.056) were not statistically significantly different ($p = 0.923$; df = 1).

However, when the pre-requisite and cumulative GPA means were examined for cohorts
1 and 2, statistically significant differences did appear. Cohort 2 had higher means for pre-requisite GPA ($M = 3.34; SE = 0.035$) and cumulative GPA ($M = 3.33; SE = 0.031$) when compared to cohort 1 pre-requisite ($M = 3.18; SE = 0.040$) and cumulative GPA ($M = 3.20; SE = 0.036$). ANOVA results indicated statistically significant differences existed between cohorts for pre-requisite GPA ($p = 0.002; df = 1$) and cumulative GPA ($p = 0.009; df = 1$).

Cohort 1 had an on-time graduation rate of 41%; cohort 2 graduated on time at the rate of 47%. Cohort was not statistically significant for timely graduation ($p = 0.205; df = 1$).

**Results Related to Research Questions**

**Research Question 1:** Is pre-admission cumulative GPA predictive of timely graduation of associate degree nursing students?

Binary logistic regression was used to determine if the independent continuous variable “pre-admission cumulative GPA” predicted the dependent, outcome variable “timely graduation” for this research sample ($N = 437$). Logistic regression results indicated that pre-admission cumulative GPA (independent or predictive variable) had an overall percentage of prediction accuracy for timely graduation (criterion or outcome variable) of 55.6% and pre-admission cumulative GPA ($N = 437; p = 0.830; df = 1$) was not statistically significantly associated with timely graduation (see Table 11 for logistic regression results).
### Table 11

Logistic Regression Results for Pre-admission Cumulative GPA and Timely Graduation

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative GPA</td>
<td>0.042</td>
<td>0.194</td>
<td>0.046</td>
<td>1</td>
<td>0.830</td>
<td>1.043</td>
<td>0.713 to 1.524</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.361</td>
<td>0.641</td>
<td>0.318</td>
<td>1</td>
<td>0.573</td>
<td>0.697</td>
<td></td>
</tr>
</tbody>
</table>

**Research Question 2:** Is pre-requisite course GPA predictive of timely graduation of associate degree nursing students?

Binary logistic regression results indicated that the continuous variable pre-admission pre-requisite GPA (independent or predictive variable) had an overall percentage of prediction accuracy for timely graduation (criterion or outcome variable) of 55.6% and pre-admission pre-requisite GPA (N = 437; $p = 0.643; df = 1$) was not statistically significant for timely graduation. These results are depicted in Table 12.

### Table 12

Logistic Regression Results for Pre-admission Pre-requisite GPA and Timely Graduation

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisite GPA</td>
<td>-0.080</td>
<td>0.173</td>
<td>0.215</td>
<td>1</td>
<td>0.643</td>
<td>0.923</td>
<td>0.657 to 1.296</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.037</td>
<td>0.573</td>
<td>0.004</td>
<td>1</td>
<td>0.949</td>
<td>1.037</td>
<td></td>
</tr>
</tbody>
</table>

**Research Question 3:** Is age or race/ethnicity associated with GPA (either pre-requisite GPA or cumulative GPA at the time of admission to the nursing program) and timely graduation of associate degree nursing students?
Binary logistic regression was performed. Key variables of age, race/ethnicity, cumulative GPA, and pre-requisite GPA were not found to be associated with timely graduation (N = 437, p > 0.05). The only factor that was associated with timely graduation was College. Even after controlling for age, college, and race/ethnicity, cumulative and pre-requisite GPA were not statistically related to timely graduation. Tables 13 and 14 depict these results.

Table 13

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>White non-Hispanic</td>
<td>Referent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>1.27</td>
<td>0.70 – 2.33</td>
<td>0.440</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2.67</td>
<td>0.78 – 9.20</td>
<td>0.120</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>0.44</td>
<td>0.13 – 1.51</td>
<td>0.193</td>
</tr>
<tr>
<td>Other</td>
<td>0.63</td>
<td>0.20 – 1.94</td>
<td>0.419</td>
</tr>
</tbody>
</table>

Table 14 illustrates logistic regression results for age, race/ethnicity, pre-requisite GPA, colleges, and timely graduation.

Table 14 illustrates logistic regression results for age, race/ethnicity, pre-requisite GPA, colleges, and timely graduation.
Table 14

Logistic Regression Results for Age, Race/Ethnicity, Pre-requisite GPA, Colleges, and Timely Graduation

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>White non-Hispanic</td>
<td>Referent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>1.20</td>
<td>0.65 - 2.19</td>
<td>0.564</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2.52</td>
<td>0.73 - 8.68</td>
<td>0.144</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>0.45</td>
<td>0.13 - 1.55</td>
<td>0.208</td>
</tr>
<tr>
<td>Other</td>
<td>0.62</td>
<td>0.20 - 1.91</td>
<td>0.403</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>College</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Referent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>2.92</td>
<td>1.76 - 4.84</td>
<td>≤0.0001</td>
</tr>
<tr>
<td>C</td>
<td>2.60</td>
<td>1.59 - 4.26</td>
<td>≤0.0001</td>
</tr>
<tr>
<td>Pre-requisite GPA</td>
<td>0.92</td>
<td>0.63 - 1.34</td>
<td>0.647</td>
</tr>
<tr>
<td>Age at Admission</td>
<td>1.01</td>
<td>0.98 - 1.03</td>
<td>0.584</td>
</tr>
</tbody>
</table>

Brief Summation of the Results

The purpose of this study was to determine whether cumulative and/or pre-requisite GPA was predictive of timely graduation for associate degree nursing program students. Age and race/ethnicity were also explored in relation to timely graduation.

Timely graduation, for the intention of this study, was progression through an associate degree nursing program’s required curriculum in sequential order without interruption or exit during the usual allotted time for completion of all required coursework. The sample comprised de-identified data for 437 associate degree nursing students from three
community colleges (College A = 141; College B = 158; College C = 138) in one Midwestern state. For this study, no relationship was found for pre-requisite GPA or cumulative GPA and timely graduation. Neither pre-requisite GPA nor cumulative GPA at the time of admission was predictive of timely graduation. Likewise, age and race/ethnicity were not associated with timely graduation.
CHAPTER V

DISCUSSION

This chapter begins with a brief summary of results followed by a discussion of
the relationships of these results with previous research. Strengths and limitations of the
current research are presented. The final section of this chapter addresses implications of
this research for associate degree admission criteria, student selection strategies, and
suggestions for future research.

Summary of Results

Prior to addressing the main question of whether pre-requisite or cumulative GPA
could predict timely graduation, it was necessary to analyze comparability of the three
associate degree nursing programs in this study to identify any systematic differences in
key demographic variables that might influence the outcomes aside from GPA. Separate
analyses were run for gender, age, and race/ethnicity. The results showed no significant
differences for gender or age at admission between the three schools. The largest
race/ethnicity group in each college was White, non-Hispanic. The second largest self-
reported group was Black, non-Hispanic for each college and the entire sample. Post hoc
analyses showed that College A had a significantly larger Black, non-Hispanic population
than both College B and College C. When GPA was analyzed with demographic
characteristics, age was associated positively with cumulative GPA and pre-requisite GPA
in that older students tended to have higher GPAs. Cumulative GPA and pre-requisite GPA also were significantly associated with each other. This was not surprising since pre-requisite GPA was a part of the cumulative GPA, so the measures were not independent. Gender was not significantly associated with GPA.

This study was conducted to determine whether cumulative GPA or pre-requisite GPA was predictive of timely graduation for associate degree nursing program students. In this study, cumulative GPA and pre-requisite GPA both showed statistically significant differences between colleges at baseline. Logistic regression revealed that neither cumulative GPA nor pre-requisite GPA was predictive of timely graduation for this sample population even after controlling for age, college, and race/ethnicity. Only college was significantly associated with timely graduation.

Timely graduation was the key consideration for this research as one means of addressing the current nursing shortage. Of the total sample, only 44% of the students graduated on time, which was defined as progression through the program’s required curriculum in sequential order without interruption or exit during the usual allotted time for completion of all required coursework. College B had the poorest timely graduation rates; only 29% graduated on time. Rates for College A (54%) and College C (52%) were similar for timely graduation. A statistically significant difference was found for timely graduation rates between colleges. Even with these noted differences for timely graduation rates between schools, no relationship was found for cumulative GPA, pre-requisite GPA, age or race/ethnicity with timely graduation in the total sample (N = 437).
After controlling for potential confounders of age, college, and race/ethnicity, no relationship was found for cumulative or pre-requisite GPA and timely graduation.

The Relationship of These Results to Previous Research

The results of the current associate degree study, which showed that neither cumulative nor pre-requisite GPA was predictive of timely graduation, contrasted with prior baccalaureate research that resulted in positive associations of GPA with nursing program success (Campbell & Dickson, 1996; Clemence & Brink, 1978; Hayes, 1981; Higgs, 1984; McClelland, Yang, and Glick, 1992; and, Yang, Glick, and McClelland, 1987). However, careful scrutiny of these studies revealed that research design differences existed between these studies and the current associate degree program research.

Nursing student success was commonly described differently than timely graduation, and other cognitive variables were used in addition to GPA as predictor variables. Three of these baccalaureate research studies (Campbell & Dickson, 1996; Clemence & Brinks, 1978; Hayes, 1981) defined the criterion variable simply as graduate or did not graduate. Campbell and Dickson (1996) indicated that pre-nursing GPA was a cognitive predictor for graduation in two studies of forty in their meta-analyses of nursing literature. Hayes (1981) found that eight cognitive variables, including select general education course grades, GPA for two freshman semesters, and SAT verbal scores, contributed significantly to the prediction of academic success as measured by graduation (though not measured by timely graduation). Higgs (1984) found consistent but low
positive correlations of pre-requisite and cumulative GPA with criterion variables of nursing course GPA, clinical GPA, and science course GPA. The remaining two baccalaureate studies (McClelland, Yang, & Glick, 1992; Yang, Glick, & McClelland, 1987) found positive correlation coefficients between predictor variables of ACT scores, high school grades, pre-nursing GPA, and select chemistry, biology, and sociology course GPAs with success criterion variables of clinical nursing course GPA and cumulative nursing course GPA. Neither McClelland et al. nor Yang et al. used graduation or timely graduation as the criterion variable. When examining demographic variables, Higgs (1984) found no relationship between age and nursing course grades; dissimilar to these findings, a statistically significant association was found in the present study between age and cumulative GPA and pre-requisite GPA. Gender and race/ethnicity were unrelated to nursing GPA in the Higgs (1984) study. Similarly, the current study found no significant relationship of gender or race/ethnicity with the attainment of timely graduation, earned by timely progression through the nursing courses.

None of the prior associate degree research spoke directly to timely graduation. Apple (2002) examined the relationship of admission GPA with completion; no association was found. These results were supported by the current study. In fact, students in lower admission GPA ranges were found to have similar graduation rates as those in higher GPA ranges. Unlike the current study’s focus on the relationships of pre-requisite GPA or cumulative GPA with timely graduation, prior associate degree program research often studied relationships of individual pre-requisite courses with student success (Felts, 1986; Higgins, 2005; Oliver, 1985). Oliver (1985) measured academic success by the first
quarter GPA and program completion. A biology course grade correlated significantly with first quarter GPA; a high school English grade and part-time vs. full time status discriminated significantly between successful and non-successful program completion (Oliver, 1985). Higgins (2005) used program completion as synonymous for success also. A significant difference was found between anatomy and physiology II, microbiology, and completion of the nursing program (Higgins, 2005). Lastly, Felts (1986) examined the GPA for support courses to determine if there was a relationship with these grades and the final GPA in the nursing courses. Support courses GPA and microbiology grades were the significant predictors for nursing course GPA.

When studying retention and attrition for a community college, Mohammadi (1994) found no relationship between age, race/ethnicity, or gender with retention or progression; similarly, the results of the present study revealed no relationship of age, race/ethnicity, or gender with timely graduation. Hill (2007) noted that associate degree programs experience the highest levels of attrition or delayed graduation. Hill (2007) found that about half of community college associate degree nursing program students graduates on schedule. This study supports these findings as 44% of this community college associate degree nursing sample graduated on time.

**Possible Explanations for Study Results**

Several reasons were considered as possible explanations why neither cumulative GPA nor pre-requisite GPA was predictive of timely graduation for this sample population. First, it is important to note that no differentiation was made between
students who exited due to academic failure, clinical failure, or for personal reasons. If the reasons for student exits had been available during this research, they could have provided a more comprehensive understanding of circumstances that impede timely graduation (Sydow & Sandel, 1998). Although a reason for exit was obtained from one college, the other two either did not record this information at all, or were inconsistent in their approach to recording reasons for student attrition. Therefore, these data were not available for the study. Higgs (1984) indicated that after the reason for exit was controlled, only then did accurate progression/graduation predictability become evident. If there are characteristics specific to this sample population that increase the risk of personal exit, admitting students by competitive ranking using pre-requisite or cumulative GPA might not increase the probability of timely graduation.

Although none of the three nursing programs in the current study was using GPA as a competitive admission criterion at the time of this study, they had all set minimal GPA criteria for admission. Two of the nursing programs had a minimum cumulative GPA admission requirement of 2.5 and one college allowed admission of students with a minimum cumulative GPA of 2.0. Still, no relationship was found for cumulative GPA and/or pre-requisite GPA with timely graduation in the total sample or when these data were analyzed by college. This implies that for this community college associate degree nursing program student population, there were unidentified variables that impacted on the students' ability to progress to timely graduation, rather than admission GPA. Given these results, setting minimum admission cumulative GPA at prescribed levels of 2.0–2.5, and using a first come, first serve model might be just as effective for student success as
measured by timely graduation as the more labor intensive selection models using pre-requisite or cumulative GPA competitive admission.

Another situation may have impacted the results of this study. One college allowed students to retake pre-requisite courses to improve their GPA. The highest grade earned was recorded for the sake of GPA at that college and for this study. The number of students who opted to retake courses for better grades was not determined. Nevertheless, since it is unknown which grade most accurately represented the student’s true academic ability, the potential exists for grade inflation and an impact on the analyses results for this study. Higher grade ranges may not have been predictive for timely graduation if the first grade more accurately reflected future performance potential.

Strengths and Limitations

The sample for this study involved student records from three associate degree nursing programs in three colleges. Using more than one college strengthens this study’s potential for research generalizability. Differences in grading, admission practices, pre-requisite requirements, and core curricula add to the credibility and likelihood that these three schools could be representative of associate degree programs in other locations. Even with baseline differences, the consistency of findings across programs contributes to the generalizability of these results.

This study was able to overcome potential barriers to data collection from multiple community college associate degree nursing programs. First, the Family Education Rights and Privacy Act of 1974 (FERPA) protects the privacy of student
educational records. Consequently, a researcher who wants student record information either has to obtain student permission or the records have to be provided in a de-identified form (Van Dusen, 2004). Either case presents challenges for the college who houses the records and may provide sufficient reason to deny access to these data. Second, if a college agrees to participate, data retrieval from multiple records, including transcripts from colleges previously attended by students who received transfer credit, is extremely time consuming. Therefore, research using data from more than one community college requires a shared commitment to the value of associate degree nursing program research.

Using cohorts for comparable nursing programs strengthened this research because it assured identification of students within the same time frames for the sample population. Given the regional similarity between colleges, it is assumed that any environmental or community events that might have impacted student attrition or retention during that time frame would have similarly impacted students in each college.

One possible limitation is related to the potential for a non-conformity approach to grades between the three colleges. Although research generalizability has been put into question when grades are involved (Anaya, 1999; Felts, 1986; Higgs, 1984; Munday & Hoyt, 1965) due to the fact grades are non-standardized between colleges, this study acknowledged and reported differences. As previously discussed, assuring grade conformity between classes or colleges, except as noted for grade ranges, was outside the scope of this research. However, if grades are not comparable, then reliability may be threatened (Salvatori, 2001). Likewise, if grade ranges are limited, their use in predictor
models may result in correlation coefficients that are lower than might be expected (Hansen & Pozehl, 1995). According to Salvatori (2001), students interested in health science programs are typically high achievers which can result in grade ranges skewed to the higher GPA limits as was noted in this study. Over 60% of this sample received cumulative and pre-requisite GPAs in the 3.01–4.0 range.

Another limitation was that a convenience sample was used. Randomization was not possible. Time, travel, and cost constraints prevented attainment of data from more schools or for more students. A second limitation was for race/ethnicity data. The federal guidelines require students to self-report their race/ethnicity group. In one college, a large student population of international students (Africans) attended. For lack of a better designation, it was assumed that these students self-designated as Black, non-Hispanic. In an attempt to promote more clarity related to actual country of origin, these data were requested. However, two of the colleges did not seek this information. It is assumed that the self reported race/ethnicity information represented a more diverse population than might have been reflected in the data. Nevertheless, the importance of these missing data may be marginal for the current study as race/ethnicity was not related to timely graduation.

Implications for Practice and Future Research

None of the prior associate degree studies investigated the relationships of pre-admission GPA to timely graduation. The fact that such research is lacking for associate degree nursing programs, despite representing the largest public nursing educational
sector in the U.S., contributes to the value of this study and its results. Additionally, notable differences related to persistence to graduation between associate degree and baccalaureate student populations reinforce the need to study and report findings specific to associate degree nursing programs (ACT, 2006; Auerbach, Buerhaus, & Staiger, 2001; Mohammadi, 1994; Shelton, 2003).

The rationale for using selective admission criteria which utilizes pre-requisite or cumulative GPA is based on the expectation that these methodologies will admit the most qualified student with the highest probability for nursing program completion. Implementation of this student selection system is very labor intensive; someone or a group of individuals needs to be dedicated to this selection process. Supporters of competitive admission strategies that use GPA as a selection criteria abound (Agho et al., 1999; Gallagher, Bomba, & Crane, 2001; Nash, 1977; Newton, Smith, Moore, & Magnan, 2007; Salvatori, 2001). However, the results of this study do not support the use of a competitive admission process based solely on cumulative or pre-requisite GPA for associate degree programs when the desired outcome is timely graduation. Byrd, Garza, and Nieswiadomy (1999) studied clusters of independent variables for predictability of program completion. These researchers found that science GPA with pre-nursing GPA had a positive association with program completion. Continued research should be carried out in associate degree nursing programs to determine which independent variables are predictive of timely graduation, including research that targets single science courses and cluster variables as predictors.
Campbell and Dickson (1996) recommended that comparable institutions should execute collaborative research for better understanding of the relationships of grades and the probability of graduation. Research specific to associate degree student populations and nursing program outcomes is needed to add to the body of knowledge for associate degree education. Additionally, associate degree nursing program administrators need to make decisions on admission strategies and criteria based on best evidence, including research outcomes, instead of common or past practice.

Vance and Davidhizar (1997) suggested that nursing faculty should determine the best admission strategies for the student population they serve. The only way to evaluate effectiveness is to carefully examine the data and outcomes specific to each nursing program or programs within defined regions. The current research was designed to accomplish this objective; however, given the results of the present study, more research is needed to determine what alternative approaches can be applied to assure timely graduation. Although outside of the scope of this research, it is important to determine what support systems (Habley & McClanahan, 2004) work for associate degree nursing students. This study did not collect data on what students perceived as supportive or detrimental to success in the community college environment. Every student who exits could be asked what might have been done differently to support their progression. Likewise, students who are successful should be asked what support mechanisms allowed them to stay in nursing school to the point of graduation.

For both retention and graduation rates, baccalaureate students have higher success rates when compared to associate degree student populations (ACT, 2006). When
compared to baccalaureate students, the associate degree student is typically older, works more hours, and carries a heavier family responsibility burden which may contribute to higher attrition and lower graduation rates (Shelton, 2003). Unfortunately, these variables do not lend themselves to intervention. Age, family responsibilities, and the amount of hours worked cannot be used ethically to determine or deny admission. Therefore, these differences suggest the need for more research specific to the associate degree student population to determine effective strategies to support retention.

Factors related to attrition not considered by this study design could have influenced the dependent variable and lend themselves well to future study. These include intrinsic student characteristics such as motivation, self-discipline, self-esteem, communication skills, interpersonal skills, and student learning styles. Other factors that might impact success after admission to an associate degree nursing program are commuting distance to and from college, the number of general education courses taken with nursing courses, part-time versus full time attendance, the number of hours worked weekly in addition to school, or the impact of family obligations.

Shelton (2003) found that students who benefited from greater perceived faculty support were more likely to persist to graduation. Two forms of faculty support might enhance the nursing students’ probability of success (Shelton, 2003). Psychological support provides the student with a sense of competency and self-worth. Functional support promotes achievement of tasks and skills to reach goals of persistence and academic success (Shelton, 2003). A qualitative approach to scientific inquiry may be useful in exploring variables which impact student attrition or progression to graduation.
when students exit. Habley and McClanahan (2004) recommended that research should be balanced between studies of student attributes as well as institutional characteristics or practices that contribute to students’ failure to progress.

Conclusions

The findings of the present study show that neither pre-requisite nor cumulative GPA (over the threshold of 2.0) predicts timely graduation from associate degree RN programs. Although these findings should be interpreted with some caution, due to the limitations described previously, they have implications for associate degree nursing programs in the community college setting. Although it has become common practice to use pre-requisite or cumulative GPA at admission to select those students believed to be most likely to progress to graduation, the results of the current study indicate that common practice might not actually provide improved outcomes related to timely graduation from the simpler first come, first serve model and a baseline minimum admission GPA.

The nursing shortage is a real threat; nursing programs have an obligation to strive for increased graduation rates to meet community needs for quality nursing care. If further research on individual associate degree nursing program admission criteria continues to demonstrate no predictive relationship between cumulative and pre-requisite GPAs and timely graduation for associate degree students, administrators interested in student success might be well advised to shift their focus from selective admission criteria to strategies to minimize attrition after the students are enrolled.
Finally, although GPA has been suggested as an indicator of future academic achievement, the results of this research revealed that neither cumulative GPA nor pre-requisite GPA were predictive of timely graduation for students from three associate degree nursing programs. In fact, there was no statistical difference in timely graduation rates between the students in the 2.0–3.0 cumulative and pre-requisite GPA ranges and those in the 3.01–4.0 cumulative and pre-requisite GPA ranges. This unexpected result in anticipated academic performance or progression to timely graduation remains unexplained. Prior baccalaureate research had noted positive associations of cognitive variables with graduation. However, none of the prior associate degree studies investigated the relationships of pre-admission GPA to timely graduation. Therefore, the results of this study are unique and contribute to the science of nursing education.

It is recommended that future studies employ a longitudinal design for associate degree nursing students in several community colleges that share similar admission strategies. This research might not only address admission criteria and their relationship with timely graduation, but also simultaneously examine student perceptions of retention support systems. Study of variables of self concept, positive self-esteem, realistic self appraisal, and long term goal setting should be included in future research. These were found to have a strong positive relationship with persistence to graduation for Black students by Tracey and Sedlacek (1987). Student exits should be tracked to determine if patterns are evident for certain classes or semesters. Qualitative data should be acquired to understand reasons for exit and to determine ways to improve attrition accordingly (Baird, 1990; Habley & McClanahan, 2004; Mohammadi, 1994; Sydow & Sandel, 1998).
The costs of attrition are high for students and educational institutions alike (Habley & McClanahan, 2004); measures to prevent attrition must be explored. Admission criteria that affect students, programs, and ultimately the community should be based on sound scientific evidence. The results from this study can be used as a catalyst for associate degree nursing programs to continue to evaluate effective admission criteria.
REFERENCES


Workforce supply implications of later entry into nursing. *Health Affairs, 26*(1),
178–185.

Colleges (Research No. 90-1). A Publication of the Office of Higher Education
Research, College of Education, University of Kentucky.

hospital registered nurses getting better or worse? [Electronic version]. *Nursing
Economics, 23*(2), 61–96.

and quality of patient care. [Electronic version]. *Policy, Politics, & Nursing
Practice, 1*(1), 5–15.


2005: Registered Nurses.* Retrieved February 18, 2007, from


integrative review and meta-analysis. *Journal of Professional Nursing, 12*(1), 47–
59.


Appendix

Approval Letter from the Human Subjects Institutional Review Board
Date: May 15, 2009

To: Nickola Nelson, Principal Investigator
    Joyce Thompson, Co-Principal Investigator
    Amy Curtis, Co-Principal Investigator
    Delores Jackson, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number: 09-05-16

This letter will serve as confirmation that your research project entitled “Admission Criteria and Graduation from Nursing Programs” has been approved under the exempt category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may only conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: May 15, 2010