SELECTED BACHELOR OF SCIENCE IN NURSING PROGRAM VARIABLES

IMPACTING GRADUATE SCORES ON THE NATIONAL COUNCIL LICENSURE

EXAMINATION FOR REGISTERED NURSES

A Dissertation

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Lois B. Borek

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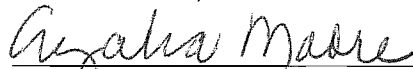Lois B. Borek

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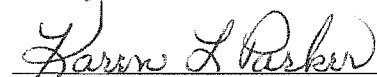
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ABSTRACT

Students graduating in 2005 from a state approved BSN program in a Christian University experienced a reduced passing rate on the NCLEX-RN licensure examination as compared to their peers in 2004. An examination of program variables provided insight into the cause for such decline. The quantitative analysis of variables reported in this study identified the significant differences occurring between the two groups of students as (a) cumulative GPA, (b) grades in selected pre nursing science courses, and (c) grades in post admission nursing courses. Findings from this study may enable program administrators to better identify students who have special needs prior to program admission, program completion, or NCLEX administration, allowing for tutorial and remedial programs.

ACKNOWLEDGEMENTS

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1. INTRODUCTION

The California Board of Registered Nursing (2004) reported that schools of

nursing in several states including California, Georgia, Iowa, Connecticut, Massachusetts,

Mississippi, New Mexico, North Carolina, Ohio, and Virginia experienced declining pass

rates on the professional licensure examination over the period 2000 to 2005 (NCLEX-

RN Task Force Report, 2004; Sayles, Shelton, Powell, 2003). Other researchers (Aucoin

& Treas, 2005) reported that approximately 10% fewer examinees passed the National

Council Licensure Examination for Registered Nurses (NCLEX-RN) from the first

quarter to the second quarter of 2002. Authorities who address declining pass rates face

the challenges of reversing the trend. Thirty-one states have established task forces who

have addressed research designs for identifying program variables related to this problem.

Currently, numerous states have the percentile rate of 70% or lower as a line of

demarcation between program verification and mandated innervations (NCLEX-RN Task

Force Report, 2004).

Performance on the NCLEX-RN is a primary measure of success for any nursing

program. State licensing agencies and educational accrediting bodies use graduate

success as an indication of program achievement.

> Whenever there are changes in the test, as there are every 3 years, faculty
> are concerned whether or not they are providing adequate preparation for
> their graduates. With the modified test plan and adjusted pass score
> implemented in April 2004 faculty are feeling particular pressure (Aucoin
> & Treas, 2005, p268).

According to Wheeler (1998), two attributes provide evidence of the ability of

nurses to practice safe and effective nursing care. The prospective nurse must first

graduate from a state board-approved nursing school. Then, the graduate must pass the

NCLEX-RN that is designed to assure that candidates possess minimum knowledge and skills necessary for safe and effective nursing at the entry level (National Council of State Boards of Nursing, Inc., 1999).

Institutions that graduate registered nurses (RN) must admit and retain students who complete the requirements for the degree and pass the NCLEX-RN. Identification of variables used as predictors of success on the examination allows colleges to select those students most likely to be successful. Administrators of nursing programs throughout the United States recognize the need to identify variables that caused a diminution in student success on the NCLEX-RN.

Aucoin and Treas (2005) after studying 4,000 registered nurses who were within six months of graduation arrived at a number of recommendations designed to improve programs of study by making the courses more directly parallel to the contents of the NCLEX-RN. Among the recommendations generated by these authorities were inclusions of significantly more clinically related work. Another recommendation was to include advanced cardiac life support certification, intravenous therapy training, critical care and conscious sedation as points of instruction in their programs. In addition, the authorities associated long term care instruction with NCLEX-RN success.

Statement of the Problem

At a Christian based university in the Southeastern part of the United States, there were documented differences in the pass rate of graduates who took the NCLEX-RN in 2004 and in 2005. For the year 2004, the pass rate at this university was 96%. The 2005 pass rate declined to 81%. This decline created the need to identify program variables related to the student's successful performance on the test.

The change in success rate on the NCLEX-RN raised several questions. Which program variables attributed to the differences in student success? Were there differences in grades of students taking selected nursing courses between the two years? Were there differences in core curriculum grades of the students? Were there significant differences in the student's cumulative grade point averages? Were there differences in student demographics?

Background of the Study

The research population for this study is the students who graduated from the selected university with a Bachelor of Science Nursing degree (BSN) in 2004 and 2005. The degree requires 122 semester credit hours earned over four years. During the first year of college, the students completed general core courses. The students completed the generic BSN over the next three years.

Each prospective student submitted an application to the nursing department for consideration (Appendix A). Transcripts from all college work were used to verify a cumulative GPA of 3.0 or greater. In addition, the applicant submitted a 300-word essay describing his or her desire to enter the nursing profession. Two recommendations were required, one letter of recommendation was a character reference and the other recommendation was from an academic instructor. A personal interview with a member of the nursing faculty completed the process.

Admission requirements for the nursing program at the selected university are consistent with nursing programs nationwide. Table 1 summarizes the admission criteria for 160 institutions.

Table 1. Admission Criteria used by Baccalaureate Nursing Program (n = 160)

Criteria	n	%
College GPA	139	86.9
ACT	61	38.1
High School GPA	59	36.9
Other	54	33.8
SAT	52	32.5
Reference Letter(s)	45	28.1
Interviews	24	15.0
Standardized Entrance Exams	12	7.5
Mathematics Exam	10	6.3
Reading Comprehension	8	5.0
Critical Thinking Assessment	3	1.9
Faculty-Made Entrance Exam	1	0.6
(Crow, Handley, Morrison, Shelton, 2004)		

The first year general core courses were completed with a grade of "C" or higher. These foundation classes included two English courses, one basic math course, and a basic computer skills course. In addition, required science course work included two Anatomy and Physiology courses, one Chemistry course, and one Microbiology course. Two nursing courses, Introduction to Nursing and Medical Terminology, were required prior to entry into the nursing program (School of Nursing, 2004).

After acceptance into the three-year program, students complete 56 hours of nursing courses (Appendix B). These courses included pedagogical classroom contact and clinical study. Each course or clinical experience was taken sequentially and each one built upon previous courses or clinical study.

During the first year in the nursing program, instruction within the classroom and clinical courses continued to be a fundamental part of the dissemination of nursing principles. The research population took courses such as Pathophysiology and Fundamentals of Nursing. Students attended classes that taught hospital documentation methodology, such as computer generated nursing notes and medication documentation.

In addition, students received guidance for providing instructions to patients. Once a week, selected clinical courses placed the students in a hospital environment.

The second year of nursing continued to build a foundation through the Introduction of Pharmacology and the study of medical surgical procedures. These nursing core courses address drug interactions, and medical/ surgical procedures. This year, students were allowed the opportunity to become more proficient in skills while providing integration of knowledge through a clinical setting two or three days a week.

By the third or senior year, nursing foundations were established and most of the classroom instruction was devoted to the development of strategies for mental health, community service, and family planning. The program culminated with students selecting hospital rotations of interest.

Nursing programs in other universities contain similar courses of study. Curricular variables within the programs are sufficiently common to permit the researcher to extrapolate variables related to student success or failure on the NCLEX-RN (Aucoin & Treas, 2005; Marshall, 1999; Percoco, 2001; Waterhouse, & Beeman, 2003).

The Professional Significance of the Study

The study described herein represents a contribution to other studies of particular importance related to identification of variables associated with student success in passing the NCLEX-RN. In addition, studies conducted by state boards of nursing researchers are carefully analyzing nursing programs having a pass rate of less than 75%. The University of Massachusetts, College of Nursing; the University of Southern Alabama, San Diego City College and similar institutions of higher education have

researchers that seek to determine a relationship between nursing programs and student success rates on the licensure examination (NCLEX-RN Task Force Report, 2004).

Nursing education is a scarce resource for several reasons (Engelhardt, 1986). First, nursing programs are expensive to operate, requiring a minimum standard of faculty-to-student ratios in clinical settings, requiring laboratory facilities that must be technically current and requiring an academic program that teaches critical thinking skills. Second, the prediction is that there will be continued budget constraints and declining grants (Rawlins, Riordan, Delamaide, & Kilian, 1991). Third, student failure is costly. Capoor (1983) reported that it cost twice as much ($22,644) to educate an unqualified student as it took to educate a qualified student ($10,812).

Each nursing program is approved and regulated by a State Board of Nursing. A nursing program with a high NCLEX-RN failure rate is at risk of losing funding and board certification (Mangan, 1997; Wilson, 1987). In addition, students who fail to complete the program take the place of potentially successful students and consequently place the nursing program in economic and academic jeopardy (Wilson, 1987).

Because of the limited funding at institutions of higher education and the increasing demand for qualified nurses, it is important to develop and implement a policy that fairly allocates nursing positions to those students deemed most likely to complete the program and pass the NCLEX-RN. Such a policy ensures a reputable, non-biased nursing student educational program resulting in successful nursing graduates.

Prior studies of nursing programs provide conflicting evidence concerning factors in nursing programs that impact student success on the NCLEX-RN (Drake, & Michael, (1994); Horns, O'Sullivan, & Goodman, (1991); Krupa, Quick, & Whitley, (1988);

McClelland, Yang & Glick, (1992); Percoco, (2001); Yocum & Scherubel, (1985); Woodham & Taube, (1986) found that academic achievement impacted student success on the NCLEX. Dell and Valine (1990); Foti and DeYoung, (1991); Lengacher and Keller, (1990); McKinney, Small, O'Dell, and Conrad, (1988); Mills, Sampel, Pohlman, and Becker, (1992), and Whitley and Chadwick (1986) concluded that cumulative GPA was the best predictor of student success on the NCLEX-RN.

Identifying demographics related to the graduate success rate of the NCLEX-RN provides another dimension of study. Froman and Owen (1989), and Beeson and Kissling (2001) found age to be related to success on the NCLEX-RN. Marshall (1999) found relationships for all tested demographics: age, gender and ethnicity, but in the final analysis found only ethnicity to be statistically significant as a predictor of student success on the examination.

Studies have been inconsistent in their identification of science pre-nursing program variables as predictors of success on the NCLEX-RN. The studies included courses in Anatomy and Physiology, Chemistry, and Microbiology. Waterhouse, Carroll and Beeman (1993), Glick, McClelland, and Yang (1986), Quick, Krupa, and Whitley (1985), Whitley, and Chadwick (1986) all found science pre-nursing courses as predictors of student success on the NCLEX-RN. In contrast, Foti and De Young (1991) and Glick et al (1986) did not find a relationship between the same courses and student success on the NCLEX-RN.

In addition, studies that address nursing program courses are also inconsistent. Barkley, Dufour, and Rhodes (1998), Campbell and Dickson (1996), Glick et al. (1986), Waterhouse, et al. (1993) and Woodham and Taube (1986) found that nursing courses

significantly impact student success on the NCLEX-RN. However, Drake and Michael (1994) concluded from a study of eight theory or didactic courses in nursing that these courses lacked validity for identifying students most likely to succeed on the NCLEX-RN.

Since the literature is inconsistent in identifying program variables that are related to student success on the NCLEX-RN, further study is necessary. Results of the study reported herein contribute to the growing body of research that facilitate program planners in identifying statistically significant program variables that lead to student success on the NCLEX-RN.

Hypothesis of the Study

This study addresses two problems. First, there is a drop in the NCLEX-RN pass rate from the year 2004 to 2005 at the selected university. Second, the variables that predict a pass or fail on the NCLEX-RN are not apparent. Four null hypotheses were formulated to address these problems.

H_{01}: There are no significant differences between the nursing course (Medical/Surgery) grades of students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

H_{02}: There are no significant differences between the pre-nursing science course (Anatomy and Physiology, Microbiology and Chemistry) grades of students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

$H_{03:}$ There are no significant differences between the cumulative GPA of the

students that completed the BSN program at the selected university in 2004 and those that

completed the program 2005.

H_{04}: There are no significant differences between the demographic variables of

age, ethnicity, or gender between the students who completed the BSN program at the

selected university in 2004 and those who completed the program in 2005.

Overview of the Methodology

This study is a quantitative analysis of variables that identify successful

completion of the nursing program at the selected university as defined by students

passing the NCLEX-RN. The data for this study was gathered from the archival records

of students who completed a four-year registered nursing (RN) program in a Christian

institution of higher learning and who completed the NCLEX-RN for the years 2004 or

2005. These years were selected due to a noticeable difference in NCLEX-RN pass/fail

rates at the university. During these two years, no known changes were made in the

admission policies, nursing curriculum, faculty/student ratio, grading procedures or

retention requirements in the school of nursing. There were no known significant changes

in the nursing program that might have affected the outcome of this study.

A causal comparative research design was used for the study. Descriptive

statistics reported the demographics, including age, gender and ethnicity. Since the

NCLEX-RN is a dichotomous dependent variable with the majority of the pass/fail

falling into one category (passing), the selected statistical analysis was logistical

regression. To reduce the effects of multicollinearity among the independent variables a

principle components model was designed and implemented.

Delimitation of the Study

The study includes subjects from the years 2004 and 2005 from one university.

Only subjects from a BSN program participated in the study.

Definitions of Key Terms

Operational definitions for this study are:

- BSN: Bachelor of Science Registered Nurse. A nursing program of study completed in a 4-year degree program;

- CGPA: The cumulative grade point average of all academic courses taken during the degree program;

- Demographic: age, ethnicity, and gender;

- NCLEX-RN: (NCLEX-RN) The National Council of Licensure Examination, an examination that each nurse is required to pass before state licensure is awarded;

- Nursing Courses: Required two-semester course taken exclusively in the nursing program;

- Science Courses: All science courses required before admission into the BSN nursing program: Anatomy and Physiology, Microbiology, and Chemistry;

- Success: "Pass" score on the NCLEX-RN.

Organization of the Dissertation

Chapter 1 is a discussion of the national trend of declining scores on the NCLEX-RN of graduates from nursing programs. A statement of the problem at the selected university in the years 2004 and 2005 follows this discussion. The background of the study contains a description of the nursing program at the selected university during the two years of the study. The program significance of the study contains a description of similarities found between the program at the selected university and earlier research linking success on the NCLEX-RN to particular program variables. Four hypotheses, an overview of the methodology and operational definitions conclude chapter one. Chapter 2

is the literature review, the rationale for the study, the history of the licensure

examination and an empirical framework of nursing program cognitive and non-cognitive

variables. Chapter 3 is the methodology of this study. Data for the study is presented in

Chapter 4. In Chapter 5 a report of the findings, discussions and implications of the study

are presented.

2. LITERATURE REVIEW

The review of selected literature is divided into five sections. The first section addresses the history of licensure examinations for nurses. The second section focuses on the National Council of Licensure Examination (NCLEX-RN), which is the current licensure examination. The third section presents selected studies that assess variables related to student success on the NCLEX-RN. The fourth section presents selected studies related to the lack of student success on the NCLEX-RN and places the problem in a national perspective. The fifth and final section presents selected studies that analyze the patterns and trends impacting nursing programs.

With the exception of history, the literature review was limited to books, periodicals, federal and state government studies and publications, professional literature and dissertations published during the period 1985 to 2005, inclusively.

History of Nursing Licensure Examinations

This section presents the history of the licensure examinations for nurses. Before the 1940's, each state independently wrote and regulated policies for testing and granting licensures to registered nurses (RN) (Matassarin–Jacobs, 1989). With the formation of the National League of Nursing (NLN) in 1942, the organization created the State Board Test Pool Examination (SBTPE). The NLN made this first national examination available to all states. By 1952, many states required nursing students to pass the SBTPE, but each state made the decision concerning an acceptable passing score.

The SBTPE was a paper and pencil test that included five sections. A score from each sections resulted in the composite score. The content areas included medical,

surgical, psychiatric, pediatric and maternity nursing with each section having equal

weight for scoring (Bell & Maritndill, 1976).

Nursing skills and knowledge changed in order to keep pace with new medical

practices and a growing base of medical information. In 1978, the National Council of the

State Board of Nursing (NCSBN), a non profit voluntary organization whose membership

consisted of 61 boards of registered nurses in 50 states was given the responsibility to

develop, publish, and score a national examination, the NCLEX-RN (Wheeler, 1998).

The NCSBN administered the examination and the State Board of Nursing released the

results.

National Council of Licensure Examination (NCLEX-RN)

This second section focuses on the National Council of Licensure Examination

(NCLEX-RN), which is the current licensure examination. In 1982, a new criterion-

referenced examination (NCLEX-RN) replaced the former SBTPE. The new test

integrated the previous five separate content areas into one test with the focus on nursing

skills. This revision eliminated individual scores by content areas. A national passing

score of 1600 was established from a test that consisted of 300 questions (Woodham &

Taube, 1986).

NCSBN frequently conducts nursing job analysis to make sure the examination

reflects the appropriate content. Job analysis includes polling recently certified nurses and

having them define nursing actions and competencies needed during the first six months

of employment (Aucoin & Treas, 2005; NCLEX-RN Task Force Report, 2004). By 1986,

job analysis resulted in100 additional questions being added to the 300 items. The

NCLEX-RN content includes the nursing process and client needs. In addition, the

NCLEX-RN incorporates the human maturation process from the pre-natal period through senescence. Health problems are organized according to the systems of the body and the test includes health problems generally found during different maturation levels (Marshall, 1999).

The current test emphasizes one of client locus of control and includes four major activities that accounts for 63% of the nurse's work time. The major components include assessment/evaluation activities, 19%; medication-related activities, 16%; health care team activities, 14%; and routine care/procedure activities, 14%. The remaining components include psychological needs, education, ethical and legal, and administrative duties (Aucoin & Treas, 2005; Schwarz, 2005).

A selected panel of judges updates the NCLEX-RN every third year (California Board of Registered Nursing Task Force, 2004). The judges, representing diverse nursing careers and widespread geographical areas in the United States, formulate questions representing the different aspects of nursing (Schwarz, 2005).

In 1988, the examination grading scale changed from a five part examination on a paper and pencil test with numerical scores to a "pass" or "fail" criterion referenced test for nursing (Arathuzik & Aber, 1998). To reflect current technology, NSCBN introduced in 1994 the Computer Adaptive Testing (CAT) format to the NCLEX-RN. NSCBN reports the advantages of the CAT over paper and pencil format are a greater efficiency in measurement, faster return of scores, shorter testing time, and year around availability of testing (Schwarz, 2005).

The test is scored based on the number of questions answered correctly. The questions have a weighted level of difficulty. The examinees must answer 5% of the

more difficult questions and a minimum of 75 questions correctly. Each incorrectly

answered difficult question prompts a less difficult question from the test bank. Two

hundred and sixty-five appear in the test bank. A six-hour time limit is set for the

examination (Schwarz, 2005).

The NCSBN implemented the latest NCLEX-RN in 2004 based on a framework

of client needs. Item format changes to the NCLEX-RN include sentence completion and

information retrieval from graphic materials, charts, tables and images. The NCLEX-RN

retained the four-option, multiple choice item format (Schwarz, 2005).

Variables Related to Student Success on the NCLEX-RN

This third section presents selected studies that access variables related to student

success on the NCLEX-RN. Researchers have identified a wide variety of variables

thought to be significant to the NCLEX-RN examination. Glick, McClelland, & Yang,

(1896), found significant correlations between grades in clinical nursing courses, pre-

nursing GPA, and grades in pathophysiology. In addition, they found GPA for nursing

courses as indicators of success on the NCLEX-RN.

Brown (1988) conducted a study that included 254 BSN students from four

schools in the University System of Georgia. The study was conducted using variables

grouped into three categories: preprogram, program variables, and student performances

on state licensure. The researchers concluded that program variables had the most

significant predictive ability (i.e., nursing cumulative grade point average, graduating

cumulative grade point average and five exams comprising pre-RN tests for the NCLEX-

RN). It also concluded the NCLEX-RN to be similar in design to the previous state

examination the SBTPE. Brown reported the content of the NCLEX-RN was science

based and concluded NCLEX-RN success to be based primarily on knowledge of the

sciences with ability to read and comprehend as an important factor for NCLEX-RN

success.

Nursing Course Variables

Woodham and Taube (1986) conducted an ex post facto correlational study of

105 students from three consecutive nursing graduating classes. Data gathered for this

study included age at graduation from the nursing program, high school class rank

percentile, SAT verbal scores, SAT math scores, percentage scores for each of seven

nursing major didactic courses, and the NCLEX-RN scores. The study revealed a

significant positive relationship at the 1% level for all nursing didactic course grades with

NCLEX-RN scores. Correlational results of Pearson r ranged from .51147 to .66746. It

was concluded that the didactic courses in the nursing program were courses most able to

predict student performance for the NCLEX-RN.

For the year 1988, Krupa, Quick and Whitley (1988) also found nursing theory

course grades to be directly related to NCLEX-RN performance. In addition Krupa et al.

correctly classified 75% of the students into a pass or fail categories for the NCLEX-RN

scores.

McKinney, Small, O'Dell, and Coonrod (1988), used several tests to analyze the

variables at a private, church-affiliated liberal arts college in Central West Virginia. The

population of the study was 136 nursing students and the variables included pre-nursing

courses, nursing theory course, nursing clinical courses, and cumulative GPA.

Correlation analysis was then used to measure the strength of the association between

NCLEX-RN scores and each of the variables. All scores were found to be positively

correlated with a significant correlation of p<. 001. McKinney et al. concluded that nursing theory, nursing clinicals and cumulative grade point average for the program were significant at p< .001.

A study of 350 students revealed some of the first data available for validity of academic predictors for the pass/fail dependent criterion. The study identified a relationship of academic variables and the NCLEX-RN. The variables used were eight nursing theory courses and six nursing laboratory courses. Because the NCLEX-RN is scored as a pass/fail, the lack of a continuum indicating gradations in level of achievement tends to weaken the magnitudes of the validity coefficients. The study was one of the first to use a continuous criterion variable with biserial correlation coefficient to improve the correlations. Results of this study indicated that those passing the NCLEX-RN tended to have a higher distribution of grades for nursing classes (Drake & Michael, 1994).

Campbell and Dickson (1996) conducted an analysis of four previous NCLEX-RN studies. In this study, the GPA of selected courses (nursing courses, nursing clinicals) and NCLEX-RN results were found to be highly correlated.

In a study to test the design of a risk appraisal instrument for use in finding predictive variables for the NCLEX-RN Barkley, Dufour and Rhodes (1998) identified C grades in nursing courses as predictors of NCLEX-RN scores. Using descriptive statistics such as Person Product-Moment correlations, Man Whitney U technique, and chi-square significant correlations were found to exist between nursing theory courses and the NCLEX-RN. In addition, Barkley et al (1998) found that the probability of failure increased when a student earned a C in any clinical course [Chi-square] (4, N=81) =

21.77, p = .000 or nursing theory course [Chi-square] (4, N=81) = 15.87, p =. 000. The

probability of failure also increased when a student earned two Cs in nursing theory

courses, [Chi-square] (4, N=81) = 27.76 or earned three Cs [Chi-square] (4, N=81) =

29.18. If students received more than three Cs the probability of failure became very high

[chi-square] (4, N=81) = 44.01. This study also found that students who passed the

NCLEX-RN earned higher grades in clinical courses than those who failed the NCLEX-

RN. Although the study found significance of grades in clinical course for program

success, the identification of clinical courses as a predictor for success in the

baccalaureate program was not found. Clinical courses teach skills and the NCLEX-RN

contains a high percentage of nursing skill- related test questions. With the use of the

Risk Appraisal Instrument (RAI) developed in this study, 95.5% of the students passing

the NCLEX-RN were identified and 76.9% of those failing were identified.

In a similar grade related study, Beeson, & Kissling (2001) reported junior level

students with no grade below C through the junior year had a 97% NCLEX-RN pass rate.

The pass rate rapidly declined with number of C grades. Students with one C were found

to have a passing rate of 84%, while students with three or more Cs, Ds, or Fs had only a

passing rate of 51%. Beeson and Kissing's (2001) study supported the Barkley data

adding results from a study of 505 baccalaureate nursing students. The results showed a

significant relationship between the number of Cs, Ds, and Fs and a pass or fail for the

NCLEX-RN. They concluded that students who received even one C in a nursing course

by the end of the sophomore year showed a higher probability of failing the NCLEX-RN.

Using logistic regression analysis, the researchers found that students who had grades

higher than C had a 97% pass rate. Both Barkley et al. (1998) and Beeson et al. (2001)

reported a correlation between the number of Cs earned in their junior year and an increased probability of NCLEX-RN failure.

In a dissertation by Marshall (1999) to determine which independent variables best correlated with outcome variables as assessed by the NCLEX-RN, nursing grade point average was found to be the most significant indictor for student success. The retrospective correlational design study was conducted from a sample size of 160 students in a baccalaureate program. The data consisted of information collected from student records between 1987 and 1993. Demographic information indicated students were 93% female, 7% male, and mean age 25.4. The ethnicity of the sample was diverse. Twenty-four percent of the students were Black, 44% were Caucasian, and 26% were Hispanic. Nine percent were classified as other but were mainly Asian. Six academic variables were analyzed to determine which of the variables accounted for the variance in the NCLEX-RN. This study selected age, previous academic degree, health related employment, pre nursing GPA, and cumulative GPA as the independent variables for the regression analysis. Using forward stepwise and backward elimination for statistical analysis, nursing course GPA was found to be the most significance. The researcher concluded nursing course GPA to be an indicator of a pass/fail for the NCLEX-RN.

Beeman and Waterhouse (2001) also worked together to investigate student success on the CAT NCLEX-RN, using a sample of 289 individuals who graduated from BSN program between 1995 and 1998. Significance was established in the study for seven variables. According to Beeman et al., the adoption of the computerized licensure examination CAT NCLEX-RN has further complicated the search for significant variables by requiring students to be computer literate. Pathophysiology, a selected

nursing course, and low grades in multiple nursing theory courses were identified as significant variables in this study. With the use of discriminant analysis 92% of the students that passed the NCLEX-RN were correctly identified.

Seldomridge and Dibartolo (2004) conducted one of the most recent studies investigating variables that identify student success in the NCLEX-RN. In this logistic regression analysis of 186 BSN nursing students from Maryland, the medical/surgical course grades were found to be significant indicators of NCLEX-RN success. Further analysis accurately predicted student success 94.7% of the time using the Medical/ Surgical nursing course grades.

While Glick et al. (1988); Marshall, (1999); Beeman and Waterhouse, (2001); Seldomridge and Dibartolo, (2004) found nursing course variables significant for NCLEX-RN success. Lengacher and Keller, (1992); McKinney et al. (1988); Whitley and Chadwick (1986) concluded only cumulative GPA for the nursing program to be related to student success for the NCLEX-RN.

Cumulative GPA Significant Variables

In a study conducted at the University of Massachusetts, significant correlations of variables were identified from the academic records of 79 BSN nursing students. Using a descriptive correlational research design Arathuzik and Aber (1998) identified cumulative GPA only slightly significant indicators of NCLX-RN success. Arathuzik et al. also reported that students with English as their primary language had higher cumulative GPA and demonstrated better study skills as compared to those with English as a second language.

Mill, et al. (1992), used five models in an analysis using stepwise logistic regression to identify variables for NCLEX-RN success. Each nursing year's cumulative GPA was found to be significant. This St. Louis Missouri BSN nursing school reported sophomore GPA as the earliest cumulative year to predict student success on the NCLEX-RN. The researchers also concluded that even though variables were identified, only 75% of all students could be identified as students who would pass the examination. They also found failure rates for the students more difficult to identify.

Waterhouse, Carrol & Beeman (1993) found sophomore GPA and GPA at the time of graduation to be significant. In a BSN program from the University of Delaware, a study of 313 students graduating in 1988, 1989 and 1990 used three separate discriminate analyses to determine the influence of predictor variables at various times in the nursing program. Of the 17 independent variables examined, 15 of the variables correlated to NCLEX-RN success. Graduation GPA followed by senior level nursing courses and pathophysiology were also found to be highly correlated and intercorrelated. In the final analysis, senior level nursing courses and graduation GPA were identified as NCLEX-RN predictors. Using the correlated variables, 93% of the students who passed the NCLEX-RN were identified.

In contrast to previously reported research, a study by Sayles, Shelton, and Powell (2003) conducted primarily to identify non-cognitive predictors of student success on the NCLEX-RN, reported cumulative GPA not to be an indicator of NCLEX-RN success. Using 83 BSN students from Northwestern State University, analysis of data revealed significant findings for nursing courses and other related academic courses that resulted

in a higher cumulative GPA. However, GPA in this study was not identified as a
significant variable.

Science Courses as Significant Variables

Barkley, et al. (1998) found that NCLEX-RN performance could be positively
correlated using nursing theory courses, clinical nursing courses, and college GPA, others
(McKinney, et al., 1988) reported conflicting results when analyzing science courses.

Glick, et al. (1986) found a relationship in the biology grade point average to be
best predictor of NCLEX success. Using both simple correlations and multiple
regressions, along with other pre-nursing variables such as high school rank, ACT scores,
and chemistry and biochemistry grades, only biology was found to be significant to
student success as measured by completion of the baccalaureate program or the NCLEX-
RN success.

Beeman & Waterhouse (2001) supported the biology findings of Glick et al.
(1986). Descriptive statistics for physiology and pathophysiology reported a mean grade
of 2.2 and 2.46 respectively for the 2 biology courses. In the final analysis, both biology
courses were found to relate well to NCLEX-RN student success. Based on the results of
this study, the researchers recommended students earn at least a "C' in physiology to
progress to pathophysiology which also requires at least a "C" grade.

Other studies reported conflicting results. Whitley and Chadwick's (1986) study
using 23 variables found biology GPA to be a significant predictor ($p < 0.000$) of success
on the NCLEX-RN as did Yang, Glick and McClelland (1987). Biology GPA was also
found to be significant for success in the nursing program ($p<0.05$, odds ratio $= 2.3$) in a

2001 study by Percoco (2001), but the results were not found to be predictors of NCLEX-RN success.

Specifically, Percoco's (2001) study reported students passing the NCLEX-RN were students found to have a mean biology GPA of 2.97 with a standard deviation (SD) of 0.65. Those students not passing the NCLEX-RN had a mean biology GPA of 2.83 and SD 0.51. Percoco stated that higher biology GPA demonstrated the greatest odds of program success. A model was formulated that incorporated biology, psychology and pharmacology. Model results found that program success could be correctly identified using pharmacology grades 76.8% of the time.

Quick et al. (1985) and Whitley and Chadwick (1986) used anatomy and physiology course grades as a specific biology variable. The results confirmed biology GPA to be related to NCLEX-RN success with a standard coefficient of 0.2540.

In contrast, the findings of Foti and De Young (1991), Glick et al (1986), do not support the results of Quick et al. (1985) and Whitley et al. (1986) Researches found in their respective studies that general biology courses did not predict NCLEX-RN success. Even though prerequisite biology classes are used by many as admission criteria (Crow, Handly, Morrison, & Shelton, 2004) there remains mixed findings in terms of relatedness of biology course GPA and the NCLEX-RN success. Substitution of general biology courses for anatomy and physiology courses in the nursing admission requirements are not allowed. Students must take two semesters of Anatomy and Physiology (Crow, Handly. Morrison, & Shelton, 2004).

Griffiths, Bevil, O'Connor, & Wieland (1995) examined the relationships between anatomy and physiology test scores and success in a required clinical nursing

course. A simple regression model indicated a relationship between the Anatomy and Physiology test and nursing courses. Anatomy and Physiology test scores were also found to be significantly related to the clinical nursing course. Even though the results were not significant for the NCLEX-RN, the results substantiated the use of Anatomy and Physiology for nursing program admission requirements.

Summary of Independent Cognitive Variables

The literature review demonstrates a variety of cognitive predictor variables for the NCLEX-RN success. The largest number of studies found nursing courses and GPAs to be significantly correlated to the NCLEX-RN success. Several studies found biology to be an NCLEX-RN predictor but just as many studies found biology either mildly significant or significant only within the program. Academic variables were found within associate degree programs as compared to nursing course variables for the baccalaureate program. These findings support the differences in pass rates found in the two nursing programs. Each study appeared to have a set of variables that were individualized by the researchers. In addition, there were many statistical methods used to analyze the variables. What remains to be established is consistency within the variables, within programs and in the application of analysis. This may be a difficult task in light of the on-going changes made in the NCLEX-RN examination.

One national study by Crow, Handley, Morrison and Shelton (2004) provided a bridge connecting cognitive variables to non-cognitive variables. Crow et al. (2004) surveyed 513 participants from BSN programs across the United States. Of the 160 responses, five significant findings for student success on the NCLEX-RN were reported. Data collection from the initial survey indicated these variables were significant to

NCLEX-RN success. Those findings were (1) the use of standardized entrance exams scores for admission criteria, (2) National League for Nursing (NLN) content at-risk scores for mental health and community health nursing for progression, (3) clinical proficiency and use of exit examination as a graduation requirement (4) commercial reviews as an intervention and (5) per cent White as a demographic variable. Descriptive statistics reported program data and student demographics, and parametric statistics were used to compare each variable to the NCLEX-RN pass rates. Demographic data fell within the range of demographic data reported by Arathuzik and Aber (1998) and Barkley et al. (1998). The results of this comprehensive national study found SAT entrance scores and an exit examination to be the only variable significant to student success rates for the NCLEX-RN. Crow et al. concluded that based on changes in the NCLEX-RN format, level of performance for passing the NCLEX-RN and new exam formats based on job analysis, limited findings of cognitive variables for the NCLEX-RN are national trends.

Literature Search of Demographics

This aspect of the review of the literature discusses non-cognitive factors. Non-cognitive factors are variables that are non-grade or test related. While non-cognitive nursing related factors could be student personality, admission interviews of students, letters of recommendations or student confidence levels, this literature search focused only on the non-cognitive variables that are generally collected for most current studies. The variables are age, gender and ethnicity.

Most of the studies found in the literature review collected and analyzed student demographics. However, few of the studies found any of the demographics to be a significant predictor for the nursing program or the NCLEX-RN success.

Demographic as Significant Variables

A dissertation conducted in Georgia by Crane (1986), first looked at non-cognitive predictors of success in an associate degree nursing program and then analyzed the significant demographic variable to clinical nursing grades. Non-cognitive variables included age, marital status, gender, number of dependent children, previous education, and ethnicity. Crane's study of 201 students in three associate degree programs reported a greater variety of students (increased numbers of non-traditional students) were in associate programs. Typically, these students were married, older, minority class, and had a greater span of academic abilities. They also had higher attrition rates than baccalaureate students, with attrition rates ranging from 27% to 55%. Using a multiple regression statistical package Crane found student age to have a direct effect on the student's overall achievement but was not found to be statistically significant for the NCLEX-RN success.

Crane's research suggested that older students were more responsible and more conscientious than younger students and thought there might be a relationship between age and clinical grades. Using freshmen and sophomore students, the results were positively correlated but proved not to be significant to NCLEX-RN success. Crane also suggested that other possible reasons for the lack of correlation may be factors like choice of the best academically prepared students, student desire, or stringent progression requirements within each nursing program.

The study found none of the non-cognitive demographic variables to be predictors of NCLEX-RN success. Crane suggested non-cognitive variables were difficult to isolate and should be eliminated from future NCLEX-RN predictive research. However, the literature search still reveals non-cognitive demographic variables to be something of interest to most nursing programs and report that most schools still use them for admission criteria (Felts, 1986; Woodham & Taube, 1986; and Froman & Odem, 1989).

Age

With nursing enrollment patterns showing an increasing average age, it is of interest to discover what findings are in the literature search concerning age. NSSRN (2000) reported diploma nursing graduates generally have a median age of 23, are single and without children, while the majority of Associate degreed graduates have a median age of 31, are married, and have children.

Felts (1986) examined five associate degree nursing programs and concluded age does not differentiate the group that will pass the NCLEX-RN. In another study, Woodham and Taube (1986) surveyed 104 associate degree-nursing graduates and also reported age not to be a significant predictor of success.

Waterhouse, Carrol, and Beeman's (1993) study of 313 students of BSN program with demographics that were predominately female, white, and 21 to 23 years of age at the time of graduation reported no direct analysis for age. Still another study by Barkley et al (1998) gathered data from 81 BSN students with ranging in age from 21 to 26 years reported no relationship between age and success. However, Froman and Owen (1989) used a recursive path analysis model to test for direct and indirect influences of student characteristics and they determined age to be a factor related to the BSN students'

success. A later study by Beeson and Kissling (2001) involving BSN student (n=505) identified age as a variable related to NCLEX-RN performance. They found that nontraditional college age students (over 23 years of age) tended to have a higher passing rate (95.7 percent) verses traditional students (88.3 percent). They also suggested that older students were more self-disciplined and experienced and found the age factor of no surprise.

Ethnicity

The number of nurses identifying their background as one or more racial minority groups grew significantly in 2000. NSSRN (2000) reported 333,368 minorities are now part of the registered nurse population. Although changing, the nursing population is still a homogeneous population. In 2000, minorities in the United States made up 31% of the population but only 13.4% of the nursing population. From 1996 to 2000 numbers of minority RNs increased by 35%. Actual growth rates for the American Indian and Native Hawaiian Islanders were the highest with a 207% increase over the previous 4 years. Hispanic /Latinos increased by 164% and the Black nursing population increased by 119%. Even though early reports indicated increasing numbers of minorities, the preliminary 2004 National Sample Survey of Registered Nurses indicated a decrease in minority growth for the nursing profession as compared to an increase in the U.S. minority population (HHS, 2000).

Figure 1: Distribution of Registered Nurses and the U.S. Population by Racial/Ethnic Background, 2004

2004 NSSRN

☐0.4% ☐3.3% ▨1.8% ▨1.5%

☐4.6%

☐68.4%

☐White, non-Hispanic	☐Black, non-Hispanic
▨American Indian/Ala. Native, non-Hispanic	☐Asian/PI, non-Hispanic
▨Hispanic	▨Two or more races, non-Hispanic

U.S. Population

▨13.7% ☐1.3%

▨4.1%

▨0.7%

☐12.2%

▨67.9%

▨White, non-Hispanic	☐Black, non-Hispanic
▨American Indian/Ala. Native, non-Hispanic	▨Asian/PI, non-Hispanic
▨Hispanic	▨Two or more races, non-Hispanic

Source - Table 3: Annual Estimates of the Population by Sex, Race and Hispanic or Latino Origin for the United States: April 1, 2000 to July 1, 2004 (NC-EST2004-03). Population Division, U.S. Census Bureau. Release Date: June 9, 2005.

Few studies were found that addressed ethnicity as a predictor of student success for the NCLEX-RN, however most studies kept ethnicity within the demographic data. Why are the minorities so under represented in nursing schools? Is ethnicity a predictor of nursing program success? Several studies were found that occurred at mainly minority schools. These schools used academic variables to test for NCLEX predictiveness. The following literature will present ethnicity as it related to the NCLEX-RN success.

Dell and Halpin (1984) conducted a study of 456 students in a predominantly black private baccalaureate nursing program. One hundred and eighty-one students graduated. Significant predictors of success for the NCLEX identified in the study were high school GPA, verbal SAT scores, math SAT scores, and senior year college GPA. Dell and Halpin's (1984) results identified significant differentiation between graduate and non-graduates with Chi square results of 51.48, p. = .001. Ethnicity was not found to be a predictor of NCLEX-RN success.

In another study Boyle (1986) identified ACT scores as significant predictor for minority BSN students but ethnicity itself did not determine the pass/fail NCLEX-RN score. Horns, O'Sullivan, and Goodman (1991) identified ethnicity as a predictor for the NCLEX-RN success. In a study of 408 students at a baccalaureate nursing school where the student population was reported to be 75% Caucasian and 25% minority, pre-admission GPA, and ethnic variables were found to be significant predictors of the NCLEX-RN success. However, Horns et al. in the final analysis concluded that skills held by the ethnicity of the population were the factors that affected the outcome, not race.

Non-Cognitive Variables other than Demographics

Mosby Assess Test and National League for Nursing Comprehensive Achievement Test for Baccalaureate Students (NLNCATBS) are helpful in identification of NCLEX-RN success. Several recent studies indicate these test may be better for identifying student success on the NCLEX-RN (Campbell & Dickson, 1996).

Campbell and Dickson's (1996) study found the NLN pre-admission examination a predictor of student success. In Campbell et al.'s study test anxiety, self-concept /self-esteem, and support group intervention strategies were found to be significantly correlated with NCLEX-RN success. Another study of 81 BSN students conducted by Barkey, Dufour, and Rhodes, (1998) found a significant positive correlation for performance on NCLEX-RN. With the use of the NLN Achievement Test, Barkey, et al. concluded that students' scores on standardized test can predict performance on the NCLEX-RN. In a 2002 study by Engelmann (2002), at-risk student intervention strategies were found to have statistical significance, $r = -.263$; $p<.05$, in a negative relationship with the NCLEX-RN. The findings reported that as the number of support services increased, NCLEX-RN pass rate increased.

Sayles, Shelton, and Powell (2003) reported that due to a precipitous drop in NCLEX-RN (98% -83.5%) passing scores and declining graduation rates (82% - 69%) at a selected university, administrators investigated the effectiveness of Total Testing package published by Educational Resources, Inc. (ERI). ERI is a 10-step program tracking critical thinking and nursing processes, documents student outcomes for accreditation, and validates curriculum against national norms. Results of the study indicated the effectiveness of the test scores on the classes regulated by the ERI improved. Those selected course were correlated with increased success on the NCLEX-RN.

Seldomridge and Dibartolo (2004) prompted by critical nursing shortage and declining national pass rate on the NCLEX-RN conducted a study of 186 BSN students at Salisbury University, in Maryland. Using GPA's from nursing courses, pre-admission

courses, test averages in Medical Surgery and the NLNCATBS, revealed NLNCATBS could successful predict 93.3 % of student success on the NCLEX-RN.

In an attempt to graduate, the maximum number of students from the states' 94 nursing programs, California has experienced declining pass rates on the NCLEX-RN (NCLEX-RN Task Force Report, 2004). Since 1996, California nursing students experienced declining pass rates on the NCLEX-RN. In 1998, scores dropped below the national average of 87.7%. Eleven of the 94 nursing programs reported a pass rate of less than 70% and 7 had a pass rate of 71-75%. In February 1999, due to the increasing number of nursing programs with a pass rate for the NCLEX-RN of 70%, a state task force was created to identify factors related to the problem. The California State Task Force sought to identify factors related to student success or failure on the NCLEX-RN, factors to improve the potential of success on the NCLEX-RN, and to provide recommendations to the nursing boards regarding research questions.

Consistent with the literature review, the task force reported that the majority of published research focused on the impact of grades in selected courses and the results from assessment tests to predict success on the NCLEX-RN. Upon further analysis, the task force identified other factors impacting NCLEX-RN success for the student. Those factors include in order of importance:

1. Students for whom English is a second language;

2. Students who work 20 hours a week or more (in a setting other than a medically related field);

3. Students who have family responsibilities at home;

4. Academic policies that permit students to withdraw form prerequisite

science courses when they are failing and retake them multiple times;

5. Delay of nursing related employment after graduation; and

6. Limited knowledge by nursing faculty about current NCLEX-RN

format.

Lack of Student Success on the NCLEX-RN

This fourth section presents selected studies related to the lack of student success

on the NCLEX-RN and places the problem in a national perspective. During the last

years of the SBTPE, 91% of the examinees received passing scores on the test (Dell &

Valine, 1990; Schwarz, 2005). However, in 1982, nursing program graduates took the

NCLEX-RN, a revised test with a different format. Results of the new examination

prompted many additional studies. In a study from four Georgia nursing schools, Brown

(1988) concluded that the format changes in the first examination were generalizable. In

Brown's study, student pass scores rates from the SBTPE examination to the NCLEX-

RN pass scores rates were consistent. The researcher concluded the tests were similar in

nature. However, Drake and Michael (1994) reported that on the first NCLEX-RN, one in

six of the nation's first time candidates failed the test. The national passing rate dropped

from SBTPE scores of 91% in the 1980's to an 84% NCLEX-RN pass rate in 1988 (Dell

& Valine, 1990; Poorman & Martin, 1991; Schwarz, 2005). In 1988, when the score

became a "pass" or "fail," the NCSBN instituted a higher passing level. From 1994 to

2000, scores on the NCLEX-RN continued to decline from 88.4% to 83.8%, a notable

decrease of 4.6% (Schwarz, 2005).

In the state of Georgia, according to the Georgia Board of Nursing (2002), students who completed the board approved programs had an 80% average passing grade on the NCLEX-RN. Similar problems were identified in other states.

In the state of Mississippi, the University of Southern Mississippi is the largest nursing program in the state. In 2000, the students achieved a passing rate of 91%. In 2003, that percentile dropped to 78.8% and in 2004 further declined to 75.3%.

In the state of Virginia, during the testing cycle from July 1, 2005 through September 30, 2005, the 14 state board approved programs had one school with a 33% pass record. Two schools had a 60% to 70% pass record. Five schools had an 80% to 90% pass record and 4 schools had a 90% to 100% pass record. These records were published by the State of Virginia NCLEX-RN pass rates (www.Allnurses.com).

In Virginia, the Danville Regional Health System School of Nursing programs for the class of 2002 reported a 94% pass rate. The class of 2003 had a 97% pass rate. The class of 2004 had an 84% pass rate and the class of 2005 had a 91% pass rate. In 2002, the national pass rate was 87% while the pass rate for the Commonwealth of Virginia was 84%. In 2003, the national rate was 87% and the pass rate for the Commonwealth of Virginia was 85%. In 2004, the national pass rate for the NCLEX-RN was 85% while the pass of rate for the Commonwealth of Virginia was 82% (www.danvilleregional.org/abprog./html). This illustrates a pattern of low scores at the state level and national level for those students taking the NCLEX-RN for the first time. Specifically several schools in other states reported their student pass rate on the NCLEX as exceeding the national averages of 64.3% in 2004 and 2005 (www.Allnurses.com).

Selected Studies That Analyze Patterns and Trends

This fifth and final section presents selected studies that analyze the patterns and trends affecting nursing programs. Since the state licensing agencies and educational accreditation bodies use success on the NCLEX-RN as an indication of program achievement, patterns and trends at the national level influencing nursing programs were included in the literature search (Schwarz, 2005). Several researchers report nursing shortages as a variable affecting nursing programs (NCLEX-RN Task Force Report, 2004).

The United States (U.S.) has periodically experienced nursing shortages. Every decade since the 1950's has been faced with shortages. However, the current shortage will not be solved as in the past with higher wages or better benefits. Unlike the past, the current nursing shortage is more complex. Three separate issues combined to form one of the most serious shortages to date. The general trend reveals a decline in nursing school enrollment, a high percentage of employed nurses reaching retirement age, and an aging nursing college faculty (U.S. Department of Health and Human Services, Bureau of Health Professionals, [BHS], 2002; American Association of Colleges of Nursing [AACN], 2004). In addition, the U.S. General Accounting Office ([GAO], 2001) reported that the demand for health care services by an aging population to be a significant factor contributing to the nursing shortage.

Recent periodicals supporting an awareness of these general trends cite research that contributes knowledge of both the current and projected nursing shortages. GAO (2001) also reported an overall decline in per capita nurse employment for 26 states during the years 1996 through 2000. The report concluded nursing unemployment (1%)

had reached its lowest level in more than a decade. The GAO (2000) also reported difficulty in hospital recruiting programs as an indicator of the nursing shortage, citing the last time hospital vacancies were over 14% was during the 1980 nursing shortage. The American Hospital Association's *Trendwatch* (2001) reported 75 percent of U.S. hospitals had shortages amounting to 126,000 vacancies. In addition, the United States Department of Health and Human, Services, Bureau of Health Professionals (BHP, 2002), and the United States Bureau of Census (2002) estimate shortages for the year 2005 to be 150,000. If the various contributors to the shortage are left unchecked, the United States Department of Health and Human Services, Bureau of Health Professionals has estimated a projected shortage of 29 percent by 2020 (BHP, 2002).

Decline in Nursing School Enrollment

Statistics are showing that enrollment figures for nursing school are down. While findings from the March 2000 National Sample Survey of Registered Nurses indicated a doubling of men entering the nursing profession, men are only 5.4% of the nursing population (HHS, 2000). Women continue to dominate the nursing workforce, making up 95% of all nurses (HHS, 2000). However, NSSRN reports that the numbers of female high school graduates choosing to enter the field are decreasing. The American Hospital Association (2001) reported less than 2% of all entering college freshmen were declaring nursing as a likely major (AHA, 2001). Historically, women who wanted a profession had two choices teaching or nursing. Crane's research (1986) indicates that the eroding of the nursing workforce is due in part to the number of career opportunities that are now available to women. Since the 1960's, opportunities for women have expanded into business, law, armed services, government, and advanced professional medical programs.

This expansion of professional opportunities for women has contributed to a decrease in nursing enrollments (Crane, 1986).

In 2003, the National League of Nurses (NLN) reported an overall decline in enrollment in all nursing schools offering a diploma program, an associate degree program, and/or a baccalaureate degree program. Specifically, the NLN reported a 23% drop in nursing baccalaureate level graduation and a decrease of 30% in graduate level programs. The American Association of Colleges of Nursing (AACN, 2002) also concurs with the NLN report, indicating a 4.6% drop in enrollment from 1998 to 1999 followed by a 2.1% drop from 1999 to 2000. AACN (2002) reported a 7.2% decrease nationally in the fall 2000 enrollment of RN to baccalaureate programs, with southern states experiencing the largest decline of 8.3% and western states reporting declines of 5.4%. That same year the AACN (2002) conducted another study that followed 326 schools over a six-year period. Data obtained from the study also revealed a trend of decreased enrollment in both undergraduate and graduate nursing programs as shown in Figure 2.

Figure 2: Total Number of RN Graduates by Degree

Source: National Council of State Boards of Nursing, NCLEX
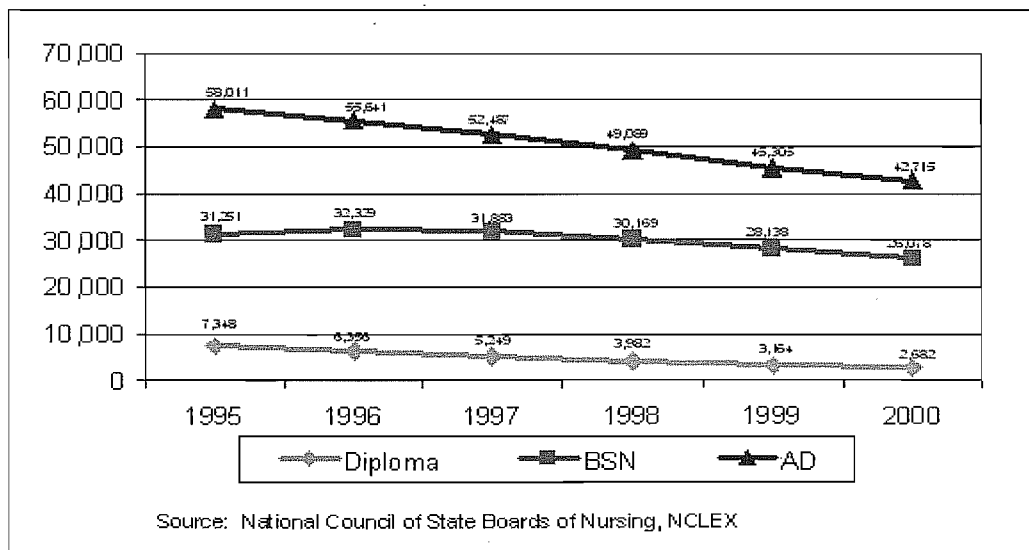
Additional evidence of the decrease in nursing programs across the United States is supported by the lack of nurses who take the NCLEX-RN. As stated by the National Council of State Boards of Nursing (NCSBN, 2000), the number of first-time, U.S. educated nursing school graduates who sat for the NCLEX-RN decreased by 28.7% from 1995-2001. For various reasons, a total of 27,679 fewer prospective nurses sat for the exam in 2001 as compared with 1995.

Changing Medical Care Affecting Nursing Programs

The delivery of medical care changes with the needs of the patient and advances in medicine. This affects the role of the nurse (Schwarz, 2005; U.S. Department of Health and Human Services, National Advisory Council on Nurse Education and Practice (NACNEP, 2002). Nurses now need to be trained as independent managerial nurses, capable of functioning in an autonomous work environment. Most feel that only the baccalaureate nursing program can fulfill this role (Beeman & Waterhouse, 2001). The National Advisory Council on Nurses Education and Practice, an advisory body to the federal Division of Nursing of National Institutes for Health, urged that at least two-thirds of the basic nurse workforce hold a baccalaureate or higher degree by 2010 (HHS, NACNED, 2002). Following the increased recommendations by federal, educational and medical organizations, hospital-based diploma programs and associate degree programs are fading out.

The latest data gathered from the preliminary findings for the 2004 National Sample Survey of Registered Nurses (HHS, 2005) indicate educational levels have been increasing. From 1980 to 2004, the greatest educational growth was RNs receiving baccalaureate and associate's degrees. The overall growth rate for BSNs was 170% and

the associate degreed programs grew at a rate of 232% as compared to the only a 15.2% growth rate for diploma degreed programs. While it appears there is a decrease in the projected numbers of graduating nurses, the BSN programs are increasing the level of education for nurses.

Aging Nursing Workforce and Decreasing Supply

In an empirically based analysis of recent workforce trends, Buerhaus, Staiger, and Auerback (2000) gathered data from the U.S. Bureau of the Census Current Population Surveys and made shortage projections based on nursing age and workforce into the year 2020. Using split-sample forecasting, Buerhaus et al (2000) estimated the United States would experience a 20% shortage in the number of qualified nurses, by the year 2020. This often cited study predicts the 20% shortage will result in a need of more than 400,000 registered nurses nationwide by 2020. With 30 states currently reporting shortages of registered nurses, the U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professionals (HHS, 2000) projects increased need in 44 states within the next 15 years. Other studies believe this to be a conservative estimate and believe the impending shortages will not only occur as early as 2008 but will be geographically more widespread (Bureau of Labor Statistics, 2002).

Nursing is the largest health care occupation in the United States. It not only supplies the U.S. with a job force of over 2 million people but it has been recognized as one of the top occupations for job growth and opportunity (Bureau of Labor Statistics, 2002). Updated Bureau of Labor Statistics publications (2004) affirmed one million new and replacement nurses will be needed by 2012. According to the report, the greatest

demand in the health care system will be in the baccalaureate prepared nursing programs

(BHP, 2004). Manuel and Sorenson's (1995) study of health care systems report a

growing need of professionals who are not only capable of grasping broad medical

concepts, but those can also provide leadership, supervision, and organizational skills.

Baccalaureate programs provide the educational foundation for independent,

knowledgeable leaders (Beeman & Waterhouse, 2001; Manuel & Sorenson, 1995).

Aging Workforce

The workforces of nursing professions include both nurses employed in the health

profession and those employed by nursing schools as faculty. Both of these nursing

workforces are aging and contributing to the shortage in nursing (Buerhaus et al., 2000).

Understanding the impact of an aging workforce and an aging faculty is essential to this

research. The aging workforce will have an immediate effect on staffing positions and the

aging faculty will impact the ability to supply the workforce with sufficient nurses to

meet the future demand.

Aging Nurses

According to U.S. Department of Health and Human Services, Health Resources

and Services Administration, Bureau of Health Professions (2000), if there is any growth

in numbers of additional nursing candidates entering the field, the supply will decline as

the rate at which the aging nurse population leaves the health delivery system, exceeds

the number of new nurses entering the health delivery system. In 1980, according to the

American Association of Colleges of Nursing (AACN, 2001), 26% of employed

registered nurses were under age 30, and 52.9% were under 40. Current data indicate

rising ages with registered nurses now averaging 43.3 and registered nurses under 30

representing less than 10% of the total workforce (AACN, 2001). The definitive source

of information regarding RNs in the U.S., the National Sample Survey of Registered

Nurses (HHS, 2000) conducted by the Bureau of Heath Profession Division of Nursing

reports that the majority of nurses retire from the workforce in their late 50s, largely

because of the physical demands of the job. In 2010, 78 million people in the general

population will retire. Included in that group will be the majority of currently employed

nurses. Thus, when health care requirements are in greatest demand, the aging nursing

workforce will make a substantial contribution to the shortage (HHS, 2000). At the

current age of the majority of nurses and with retirement approaching for many of them,

there will be dramatic shortages that can only be prevented by selecting qualified students

capable of successfully completing nursing schools.

In another study, Buerhaus et al (2000), using data from the National Sample

Survey of Registered Nurses (HHS, 2000) from 1983 to 1998, a 41% drop in the number

of registered nurses who are less than 30 years of age was reported. While the average

age of the U.S. workforce in that same period increased by 1.6 years, the RN population

increased by 5.3 years. Buerhaus' et al (2000) study projected that after the year 2010, the

average age of working nurses will be 50 years of age instead of the current nursing age

of 45. Buerhaus (1998) also concluded that the workforce shortage may not only include

projected shortages for the next 17 years, but they also suggest the shortage may be worse

as shown in Figure 3 (Buerhaus et al, 2000).

Figure 3: Age Distribution of RNs: 1980, 2000 and 2020 Projected
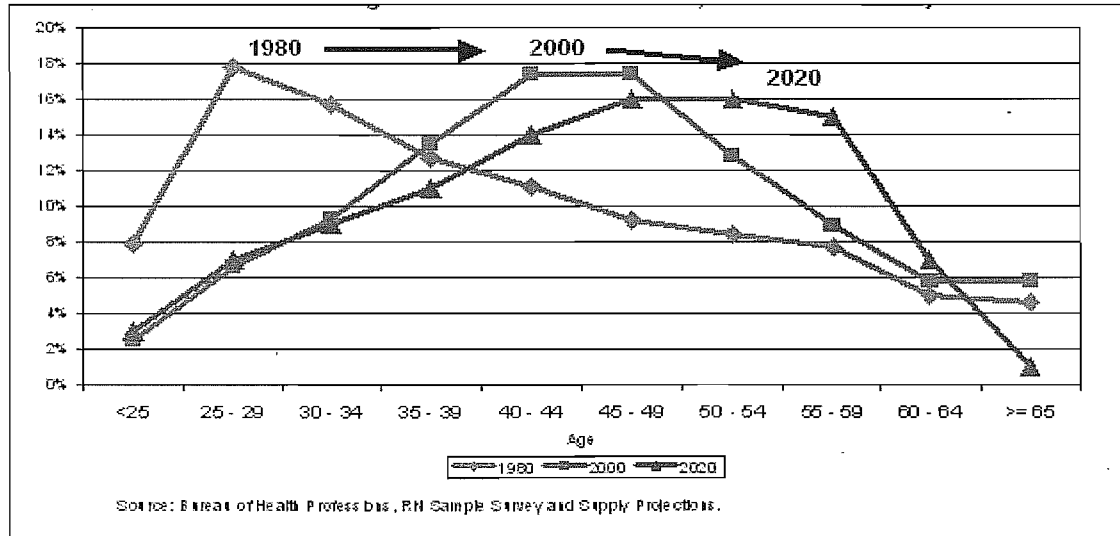
Health organizations are currently looking for solutions within the profession.

Many hospitals have been attempting to correct the shortages by offering bonuses that

encourage postponing retirement. Some hospitals entice their nurses with variable work

hours or offer incentives such as changes of job descriptions to encourage postponing

retirement. While these efforts may offer a temporary solution to the shortage, they do

not prevent the increasing age of the nurse or the approaching retirement.

Nursing Faculty

The nursing shortage is not confined to practicing nurses. Faculty administrators

nationwide report an inability to hire qualified candidates and an aging faculty that will

soon reach retirement age. The Southern Regional Educational Board (SREB) Council on

Collegiate Education for Nursing's (2002) regional study found wide spread approaching

retirement for a significant number of the nursing faculty. The average age of assistant

and associate nursing professors is currently 49 and 52 respectively (SREB, 2002). This

same survey found 144 nurse educators from 491 institutions retired during the 2000-

2001 academic year. During this same period, there were 306 full-time and 126 part-time

nursing positions available. The SREB projected that by 2006, 784 more nurse educators from southern states within the United States would be eligible for retirement. The report also indicated 306 full time and 126 part time faculty positions were vacant for the 2000-2001 academic years. The impending shortage in the nursing faculty will not only affect nursing programs, but it will also ultimately decide the future for the next generation of nurses.

The impact of an aging nursing faculty can be further analyzed using data supplied by the American Association of Colleges of Nurses (AACN, 2001). This study surveyed nursing schools and found 38 percent of the schools had turned away qualified students citing major budgetary constraints and faculty shortages that prevented the hiring of faculty and expanding of nursing programs. In 2003, National League of Nurses (NLN) (2003) reported there were 1,106 nursing faculty positions unfilled nation wide. Additional data indicated a potential loss of 750 faculty positions before the year 2006 with few graduates in programs that will prepare students for teaching (AACN, 2001). The shortage of younger educators to fill these positions may be explained by examining the length of time most nurses are able to acquire the necessary terminal degrees. The Bureau of Health Professionals reports that the average duration of time from BSN to doctoral degree is 20.9 years (BHP, 2000).

Faculty shortages will continue to increase because fewer student nurses are enrolled in academic programs that prepare them for faculty positions. In the year 2000, only 8% of 2,837 graduate nursing students were prepared to enter the field nursing education (NLN, 2003). Because there is a direct effect on availability of nursing faculty

for nursing students, this shortage will continue to limit the expansion of nursing

programs that are needed to increase the nursing school enrollments.

Aging Population Changing Health Care Needs

In the last 15 years, there has been an 18% increase in the U.S. population with a

larger proportion of this population being elderly (HHS, 2000). Furthermore, the number

of Americans age 65 and older is expected to increase from 30 to 60 million by 2030

(GOA, 2001). This large segment of the U.S. population will impact the way health

services are rendered.

Evidence of this aging population trend is apparent in the need for additional

Medicare coverage, which is being restructured by the U.S. House of Representatives and

the U.S. Senate. Medicare coverage has been broadened to include the changing needs

and attitudes of the consumer population. Nursing now and in the future will include

increasingly more home health care. As the baby boomer population approaches

retirement years and with advances in medical science that prolong life, an increasing

number of the U.S. population will require extended hospital health care, sub acute care

facilities, nursing home care or terminal facilities. This emerging type of health care

requires advanced nursing skills. Thus, these changes will alter the skills and employment

needs for nurses and will further impact the demand for additional skilled nurses. As

early as 1997, the American Association of Colleges of Nursing (AACN, 2004b) reported

that health care agencies would rely on baccalaureate nurses to fill the emerging increase

in complex nursing skills. Shugars, O'Neil, and Bader (1991) identified the changing role

of nurses that would require nurses to participate in advanced nursing roles in community

health facilities. Since nursing practices are the responsibility of the nursing educators, it

is the educator's responsibility to adjust the educational programs to fit the needs of

society. Thus as the need for nurses continues the educational requirement will broaden

to include areas of skilled public health care nurses.

The NSSRN (HHS, 2000) report that nurses are primarily employed in hospitals;

however, it also indicates the largest need, a projected increase of 155 percent, will be in

the field of public and community health and care for the elderly. In 2002, experts in

nursing and geriatrics joined forces to create the National Council in Aging Campaign. Its

purpose is to raise public awareness of the need for skilled geriatric nurses within the RN

program. Many nursing organizations have appealed for government intervention. The

United States Senate and House of Representatives each have introduced legislation that

would support the nursing profession and provide relief of nursing shortages through

supportive recruitment and retention strategies.

Federal Funding Supporting Nursing Programs

The Nurse Reinvestment Act, (P.L. 107-205) (2002) was passed by unanimous

consent by the Senate and the House of Representatives on July 22, 2002. President

George W. Bush signed the bill into law on August 1, 2002 creating P.L. 107-205. As

stated, the act provides nursing support in three major areas. It provides nursing

educational scholarships in exchange for commitment to serve in a public or private non-

profit health facility determined to have a critical shortage of nurses. There are provisions

that address the shortages realized in faculty positions nationwide. The act also provides

loan cancellation to nurses engaged in full-time advanced degree studies. These recipients

would in turn agree to spend determined amounts of time in a nursing school as a faculty

member. The act also addresses the impact of the aging population by providing funding

for nursing geriatric programs.

Many nursing positions and or salaries were cut by the enactment of the Balanced

Budget Act of 1997. This Act reduced the amount of monies given to hospitals

(Wilensky, 2000). Since labor makes up a significant portion of a hospital budget, laws

that support a refunding like the Balance Budget Refinement Act have reduced the

shortage of hospital nurses that were cut due to financial constraints. There are several

other recently implemented laws that give aid to hospitals by reviewing Medicare ceiling

charges. Enactment of the Medicare, Medicaid and SCHIP Balanced Budget Refinement

Act and the Medicare, Medicaid and SCHIP Benefits Improvement and Protection Act

has helped to restore some of the government funding (AHA, 2001). Hospitals must be

able to offer competitive salaries to qualified experienced nurses in order to operate

effectively and without shortages. While these bills have adjusted some of the hospital

financial cuts, hospital still have only limited funding available to hire needed nurses.

Great strides were taken to reduce the national nursing shortage during the 2001-

2005 tenure of HHS Secretary Tommy Thompson. During Secretary Thompson's first

year in office, grants equaling $27.4 million were awarded to 82 colleges, universities,

and other related organizations (HHS, 2001). In 2002, 34 grants worth over $8.4 million

were awarded to disadvantaged students entering nursing education and provided nurse

managed clinics in medically underserved communities (American Hospital Association,

2001). Additional grants of $22 million within the same year where awarded to support

graduate education for nurse practitioners, nurse-midwives, nurse anesthetists, and public

health nurses. Through government initiatives, progress has been made towards decreasing the nursing shortage.

Summary of Literature

In summary, the literature review revealed an increasing number of studies conducted that identify variables and their relationship to success in the nursing program and scores for state boards. In addition, the study of non-cognitive variables revealed conflicting reports. Age, race, and gender are now generally identified in the study for the purpose of a descriptive analysis of the population not relatedness to NCLEX-RN success. While the majority of research reported little correlation between demographic variables and NCLEX-RN success, some literature reported results using minorities and age as variables. While there are still inconsistencies among the studies, it is important to continue to collect and analyze demographic data.

The major area of concentration for predictive value of performance variables rests in the area of cognitive variables. Cognitive variables are those variables that are measurable by student performance. Most of the literature search since 1985 has concentrated student success on the NCLEX-RN using these variables. Pre-nursing GPA and selected courses required before admission into the nursing program are examples of pre admission cognitive variables. Since science and nursing courses provide the underlying foundation for nursing programs, these cognitive variables are of high interest to most studies and were often cited in the research. Because course grades are measured by GPAs, the literature review included GPA variables as success indicators for the NCLEX-RN.

The literature search reported a national decline in nursing student's pass rate for the NCLEX-RN. Several studies reported the formation of task force committees to investigate the NCLEX-RN content.

The fifth and final section of the literature presented patterns and trends affecting nursing programs. Several critical nursing related shortages were reviewed. Included in the review were shortages of nursing students, shortages of nursing faculty, the impact of an aging population and their medical needs and legislation impacting program development.

Most of what is understood about success in the undergraduate nursing programs comes from previous studies dealing with associate nursing programs. Each nursing program contains its own set of variables that should be identified exclusively.

A weakness in the literature is that many of the studies were based on research before 1988. In the years before 1988, the NCLEX-RN pass scores were ordinal data with a pass score set at 1600 (NCLEX, 1999). The scoring of the NCLEX-RN has since changed to a pass/fail (Schwarz, 2005). This change in grading requires dichotomous data analysis. Correlations based on dichotomous data are more difficult to analysis than two variables containing numerical values, especially if most of the dichotomous data falls in one category (example a pass rate vs. a fail rate) Ary, Jacobs, and Razavien (1985). In addition, the NCLEX-RN content has undergone several changes since 1988 (Schwarz, 2005). Therefore, data collection analysis before 1988 may not be generalizable to the analysis of current data.

While there have been increases in studies of predictive variables that identify nursing NCLEX –RN success, consistency of the variables remains in the early stages of development. There is limited analysis of variables in BSN programs.

3. METHODOLOGY

The chapter explains the methods used to perform and analyze the hypotheses of a quantitative non-experimental causal comparative study. Background of the general perspective of the methodology, research content, research subjects, and instruments used in data collection are presented in the chapter. Identification of the relationships between selected variables and demographic characteristics suggested by the literature as significant to nursing student success on the NCLEX is presented.

General Perspective of the Methodology

Because there are differences of definitions for non-experimental predictive research, this methodology was defined by Ary et al (1985). Causal-comparative research is a type of *ex post facto* (after the fact) research and is a predictive study with a correlational design. The methodology differs from experimental research in that the independent variables are not directly manipulated nor can they be manipulated; both the effect and the alleged cause have already occurred and are studied in retrospect. This type of research is commonly used in an educational setting because of ethics involved in the treatment of the selected participants (Ary et al, 1985).

The primary analysis of the research question used descriptive analysis to determine the degree of significance for the individual independent variables. The level of significance ($p < 0.05$) was established as a standard of for the study. According to Gay and Airasian (2000), and Ary (1985) this is a standard measure of significance for educational studies.

Research Questions

Are there significant differences in the selected required nursing classes, pre-admission science variables, cumulative GPAs, and demographics, in the 2004 and 2005 nursing student's program that can identify students who passed or failed the NCLEX?

The research study is designed to test the following hypotheses.

H_{01}: There are no significant differences between the nursing course (Medical/Surgery) grades of students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

H_{02}: There are no significant differences between the pre nursing science course (Anatomy and Physiology, Microbiology and Chemistry) grades of students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

H_{03}: There are no significant differences between the cumulative GPA of the students that completed the BSN program at the selected university in 2004 and those that completed the program 2005.

H_{04}: There are no significant differences between the demographic variables of age, ethnicity, or gender between the students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

The hypotheses were answered first by descriptive analysis followed by logistical regression. Each hypothesis was tested both independently and collectively.

Research Context

The setting for the study was a Christian university with enrollments that average approximately 4000 students per semester. The university is located in the southeastern

part of the United States in a metropolitan city that has a population of approximately 75,000. The School of Nursing at this university was established in 1987 and offers a generic Bachelor of Science in Nursing degree and a Master of Science in Nursing. The University's undergraduate nursing programs are fully accredited by the Commission on Collegiate Nursing Education and National League for Nursing Accrediting Commission.

In addition, the program is state and board certified by the Virginia Board of Nursing (School of Nursing, 2004). Since state licensing agencies and educational accrediting bodies use graduate success on the NCLEX-RN as an indication of program achievement, it is important that the final goal of certification be obtained (Mangan, 1997). NCLEX-RN pass rates at this university for the years 2000 – 2004 were 91%, 94%, 83%, 92%, and 96% respectively (School of Nursing, 2004). However, according to this research the pass rate for the 2005 class fell to an 81% pass rate.

The nursing program at this university is a three-year two semester consecutive program starting in the fall of the sophomore year and ending in May of the senior year. Nursing students are full-time students taking at least 15 semester hours each semester. The sequential program is outlined in Appendix B of this document. Each year the university admits approximately 55 students into the program depending on the availability of nursing slots. Application takes place in the spring semester and notification is completed by mid April of the same semester (School of Nursing, 2004).

Letters of recommendation, selected core courses and selected pre-nursing classes that must be completed with a "C" or better determine admission into the nursing program (School of Nursing, 2004).

The majority of students in the nursing program graduate within four years. Undergraduate graduation rates for 2001 –2003 were 73%, 73% and 76% respectively. According to a 2004 nursing department self-study, attrition rates are attributed to failure in classes, family problems, and relocation (School of Nursing, 2004).

Research Subjects

The population (n =118) for this study were students who met the university requirements for admission, who complete selected core classes required by the nursing department, who graduated, and who took the state boards. Subjects for the study were the graduates of 2004 and 2005. The population of nursing students at this university is homogeneous (18-24 year old, Caucasian, females). According to statistics, a small population of may give results but the larger sample size is best (Ary et al, 1985), therefore all students meeting the qualifications, from both years were part of the study. The sample consisted of 118 baccalaureate-nursing students, 49 were drawn from 2004 class and 69 from the 2005 graduation class.

Archival records indicated that students ranged at the time of graduation from 18 years of age to 54 years of age, with the mean being 23. Student gender for the study accounted for 94% female and 6% male.

The ethnic background of the subjects was fairly homogeneous, with 91% Caucasian, 3% Black, 3% Asian, and 3% other.

During the time of the study, no known changes were made in the admission policies, nursing curriculum, faculty / student ratio, grading procedures or retention requirements. Faculty assignment changes typical for an institution of higher education

were noted during this period. There were no known significant changes in the nursing program that might have affected the outcome of this study.

Instruments Used in the Data Collection

The archival data used in the research was obtained from transcripts and related documents provided from the Registrar's Office or the Nursing Department. The criteria for inclusion into the study required that each transcript contain selected core classes, graduation grade point average, age, ethnicity, gender and results from the NCLEX-RN. Permission to review students' files was obtained from the Dean of the School of Nursing (Appendix C). The researcher maintained all data within secured confines.

Protection of Human Subjects

The University Institutional Review Board approved the request for data collection (Appendix D). Guidelines set forth by the University for the Protection of Human Subjects were honored and enforced. Since all data to be collected from student records is part of official existing transcripts, the only risk to the student was loss of confidentiality. All efforts were made to ensure student confidentiality by assigning random numerical codes to the students' records in place of student names, social security number, or student identification numbers.

Student Data Collection Sheet

The researcher formatted the student collection sheet, it was the only instrument used to record the data (Appendix E). Literature was reviewed to determine content validity of the proposed independent and dependent variables as variables for this study. In a similar study by Percoco (2001), the researcher established content validity of the collection sheet by surveying a panel of Deans from various nursing programs. The

independent variables for this study were determined to be age, gender, ethnicity, selected science grades, selected nursing courses and NCLEX-RN results. In addition to the literature search, discussions were held with the Dean of the School of Arts and Science and Department Chair of the School of Nursing who supported the chosen variables and suggested adding Microbiology to the collection.

The dependent variable was the NCLEX-RN. Students are not allowed to take the NCLEX-RN without graduating from a board certified nursing school. Therefore, all students with an NCLEX-RN score have successfully completed the nursing program. A collection sheet was designed with these variables.

NCLEX-RN Reliability and Validity

The NCSBN ensures the NCLEX-RN is valid in respect to content, face, construct, and predictive and scoring validity (Schwarz, 2005). While there is an actual test score for the NCLEX-RN, they are not available to the individual student or the nursing school granting the degree. The only score reported is a pass/fail.

Panels of authorities throughout the country representing different specialties and practice settings write vast numbers of questions. Diversity in the content of the questions covering entry level nursing practice promotes content validity (Schwarz, 2005).

A set of content categories that define nursing actions and competencies is compiled every three years from all aspects of nursing. Questions are classified into a category with each test receiving sample questions from every category. Fifteen sample items determines scoring validity. These questions are not counted towards the NCLEX-RN results for the examinee but are tracked by the National Council and used to accurately calculate and measure each examinee's ability (Schwarz, 2005).

The reliability of the NCLEX-RN examination is assessed via a decision consistency statistic. This type of statistic incorporates a candidate's ability estimate and standard error with normal theory to obtain two probabilities: the probability that the candidate's "true" ability (as opposed to the estimate of their ability) is above passing and the probability that their "true" ability is below passing (NCSBN, 2002).

The two indices of reliability used by the NCLEX-RN are Kuder-Richardson and the standard error of measurement. The NCLEX-RN reliability coefficients range between .85 and .88 (NCSBN, 1991).

In an attempt by researchers and nursing school administrators to identify variables within the nursing program that related to NCLEX-RN success, two categories of variables generally recognized by nursing professions as significant will be presented. The variables fall into two categories, cognitive and non-cognitive. Cognitive variables with respect to the nursing program are academic grade point averages, all course work grades, and or standardized tests. Non-cognitive variables will include age, gender, and ethnicity.

Procedures Used

After obtaining permission from the nursing department, records from the selected years were obtained and reviewed. Initially the records were reviewed to determine if they contained the criteria for inclusion in the study. The variables included demographic data, selected GPAs, selected core classes, selected nursing classes, and results from the state boards. An administrator working in the nursing department who was familiar and responsible for the organization of the nursing records collected the data contained within departmental archives and from the office of the registrar. Before

transcribing the data, the administrator coded each data collection sheet (Appendix E) with a sequential number for each of the studied years. The assigned number was not the student's university identification number or social security number, the assigned code does not reveal to anyone the identity of the student being studied. Information concerning the variables by year was entered into the Statistical Analysis System (SAS) software package for analysis. Demographic data collected included age at time of graduation, gender, and ethnic group.

Academic Courses

Grades for the selected study were retrieved from the nursing archives and recorded directly to the Student Collection Sheet. If grades were transferred from another school, the grade was recorded as a transfer grade. Academic grades were divided into two categories; the first category was science courses and included two semesters of Anatomy and Physiology, one semester of Chemistry, and one semester of Microbiology. Nursing courses made up the second category, and included two semesters of Medical Surgery (Nursing 301 and 302).

Averages

For the purpose of the study, science grades and nursing grades were averaged separately. Taking the total number of quality points and dividing by the total number of credits calculated the average for each category. Appendix F is an academic status sheet for the nursing department and contains courses and the hours for each course. The graduation GPA was taken directly from the nursing records. The nursing GPA included all courses taken during the college program which may have included transfer grades, courses that were not directly required for the program, and all core classes.

NCLEX –RN Test Scores

NCLEX scores are reported as a pass/fail and were recorded as such. The dependent variable is the NCLEX-RN (National Council for State Boards for Nursing, 1991). A passing standard is established by the NCSBN and is the minimum level of competency that each examinee must attain in order to pass the examination. The nationally administered criterion referenced multiple-choice examination assesses basic nursing knowledge, concepts, and behaviors required for safe and effective nursing practices (Marshall, 1999; Schwarz, 2005,). Two studies (Payne & Duffey, 1986 and National Council of State Board of Nursing, 2000) indicate the NCLEX is both a reliable and a valid tool for testing. In 1988, the method of scoring the NCLEX was revised from numerical scores obtained from five individualized sections to a pass/fail (Marshall, 1999; Schwarz, 2005; Wheeler, 1998). Since 1994, graduates taking the NCLEX-RN are tested by using the Computer Adaptive Testing Format CAT-NCLEX-RN (Beeman & Waterhouse, 2001).

Independent Variables

Academic Variables: Independent variables for this study were science grades and cumulative science GPA, (i.e. anatomy and physiology, microbiology, chemistry), nursing core courses, age, race, gender, and graduation GPA for final semester (GGPA). Most of the variables chosen for this study were identified in previous studies as variables related to success in other nursing programs. The variables used for this study were present in student records within the nursing school and /or registrar's office of the university.

Cumulative Science Grade Point Average: The CSGPA was the numerical value gathered from a four-point scale with values ranging from one to four (1-4). The CSGPA included two semesters of anatomy and physiology, one semester of microbiology, and one semester of chemistry. These courses were treated independently and as an average GPA.

Graduation Grade Point Average: GGPA is the numerical value based on a four-point scale, from one to four (1-4), with one point coded D, two points coded C, three points coded B, and four points coded A. The average was computed after the final semester of the four-year program using all course grades divided by course hours (Nursing School, 2004).

Demographics Variables: demographics variables are variables that describe the sample population concerning age, gender and ethnicity.

Age: The age (number of years at graduation) of the student was retrieved from the permanent record of each student.

Ethnic background: The ethnic background was coded with numerical codes for each race.

Gender: Gender was coded one (1), representing female and zero (0), representing male.

Data Methodology

In carrying out the research design the author used several statistical procedures to measure and determine relationships between the independent and dependent variables. According to Glatthorn (1998) and Gay et al. (2000), descriptive statistics are used for the dependent and independent variables. Frequency tables were made for the categorical

variables, gender, ethnicity, age and NCLEX by each year. Mean, standard deviation, minimum and maximum were computed for numerical variables. According to Gay et al., the t test is used to determine whether the means of two groups are significantly different from one another. Comparisons of the means for each numerical variable by each year were done using t-test. The underlying normality assumption for the t-test was satisfied by Shapiro-Wilk.

A logistic regression model established the relationship between the NCLEX and possible explanatory variables. Analyses of dichotomous variables require logistic regression (Schmidt, 2000). Since the response variable NCLEX-RN is binary a logistic regression model was chosen, this is consistent with other studies (Beeman et al 2001; Percoco, 2001; Schmidt, 2000). A stepwise model selection method was employed.

The specific for the logistic model used is: $\pi(x) = \dfrac{e^{\beta_0 + \beta_1 x}}{1 + e^{\beta_0 + \beta_1 x}}$, where $\pi(x)$ denotes the expected value of Y given x. An important transformation, logit transformation of this is: $g(x) = \ln \dfrac{\pi(x)}{1 - \pi(x)} = \beta_0 + \beta_1 x$. This is similar to a linear regression model. However, instead of using the least square estimation method, the maximum likelihood method was used to estimate the coefficients due to the special characteristics of a logistic regression. The Wald test was used to test for the significance of the model and to test individual coefficient. Hosmer-Lemeshow goodness of fit statistic tested model fitness.

To reduce the effects of multicollinearity among the variables, principle components procedure was run with the use of SAS software. A significant level of 0.1 was used for entering and 0.15 for leaving the model. The resulting model was:

G(Prin1, Gyear) = 3.4888 + 0.5824(Pr in1) − 1.793 (Gyear),

Where _Pr *in*1 =) 0.4837 (AP) = 0.4762(SCN) + 0.4534(MED) + 0.5777 (GGPA).

Summary of Methodology

This chapter explained the methods used in this quantitative study of variables found to significant in passing the NCLEX-RN. The next chapter will present the results obtained from the methods.

The following descriptions of variables were used in the SAS analysis.

- Dependent Variable:

  NCLEX: 0 for failed, 1 for pass

- Independent Variables:

    o   G year: 0 for year 2004, 1 for year 2005

    o   AP: Average grade for 211-A&P and 212 A&P

    o   SCN: Average grade form 203 Microbiology and 107 Chemistry

    o   Med: Average grade from 301-Medical Surgery and 302 Medical Surgery

    o   GGPA: graduation GPA from college

4. RESULTS

As reported in chapter one, the quantitative, causal-comparative, non-experimental study for which results are submitted herein examined variables associated with the decline of the number of students passing the National Licensure Examination (NCLEX-RN). Student performance on this assessment showed a decline in the passing rate of 15% between the year 2004 and 2005. A review of professional literature supports the contention that a decline in passing rate of student performance on the NCLEX-RN is of national concern. Numerous studies have examined variables associated with this phenomenon. Since schools of nursing must provide evidence of their program effectiveness by having the graduates pass the NCLEX-RN, students who fail place their entire nursing program in jeopardy.

The professional literature for 2004 -2005 reports numerous variables ranging from English as a second language to hours of student employment outside the nursing program as significant variables that effect NCLEX-RN results. State boards of nursing and numerous colleges of nursing include researchers who are attempting to locate bona fide variables associated with successful student performance on the test.

In consultation with the Dean of Arts and Science, members of the nursing staff and members of other academic programs the researcher utilized student grades in target courses as variables worthy of consideration in this research effort. In addition to demographic considerations, the researcher identified pre nursing courses, nursing cornerstone courses, and cumulative grade point averages as potential variables worthy of research.

Each variable considered in the study addressed descriptive statistics to determine if there were significant differences between the grade point averages of the students that graduated in 2004 and those in 2005. The courses for investigation of grade point average were computed based on information found in the professional literature (Crow, Handley, Morrison, & Shelton, 2004).

After the development of null hypotheses, the researcher identified a level of significance as $p < .05$. The following information guided the researcher in the design of the study.

First, there was a decline in the percentage of students passing the NCLEX-RN from the year 2004 to 2005 at the selected school of nursing. Secondly, the variables associated with a pass or fail on the NCLEX-RN were not apparent. Four null hypotheses were formulated to address these problems. Descriptive statistics were computed for each independent variable. Frequency tables were made for the categorical variables, gender, ethnicity, age and NCLEX-RN by each year. The pass rate for the graduating nurses taking the NCLEX-RN dropped from 95.92% for the year 2004 to 81.16% for year 2005. Mean, standard deviation, minimum and maximum ranges were computed for numerical variables. Comparisons of the means for each numerical variable by each year were done using t-test. The underlying normality assumption for t-test was satisfied by Shapiro-Wilk normality test. Statistical significance was pre established at a level of $< .05$.

Each hypothesis for the study is followed by a chart that describes the findings of the investigation. Brief introductory and summary paragraphs elaborate the details of this information. The four hypotheses investigated are:

H_{01}: There are no significant differences between the nursing course (Medical/Surgery) grades of students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

H_{02}: There are no significant differences between the pre nursing science course (Anatomy and Physiology, Microbiology, and Chemistry) grades of students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

H_{03}: There are no significant differences between the cumulative GPA of the students that completed the BSN program at the selected university in 2004 and those that completed the program 2005.

H_{04}: There are no significant differences between the demographic variables of age, ethnicity, or gender between the students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

The research data is presented following each statement of a hypothesis in the following section of this report. Dialogue describing the most important information follows.

H_{01}: There are no significant differences between the nursing course, Medical/Surgery, grades of students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

To address this hypothesis, grades of students on both semesters of the Medical / Surgery courses were compared and mean differences, standard deviation, and minimum and maximum ranges were determined.

Table 2 contains the data related to the first semester of study in this sequence.

Table 2. Analysis of Medical Surgical I First Semester Grades of Nursing Students in 2004 and 2005

Measurements	2004	2005
Number	49	69
Mean	2.8571429	2.9565217
Standard Deviation	0.6770032	0.6737687
Minimum	2.000000	2.000000
Maximum	4.000000	4.000000

Forty-nine students in the graduating class of the selected school of nursing who passed the NCLEX-RN in 2004 had a mean grade of 2.8571429 on Medical / Surgical I, first semester course, with a standard deviation of 0.6770032. The minimum and maximum grade range was 2.0 to 4.0. These scores fall within the required grade point average of 2.7 mandated by the school's standards for retention in the selected school of nursing.

Sixty-nine students in the graduating class of the selected school of nursing who passed the NCLEX-RN in 2005 had a mean grade of 2.9565217 on Medical/Surgical II course, with a standard deviation of 0.6737687. The minimum and maximum grade range was 2.0 to 4.0.

Table 3 contains the data related to the second semester of study in this Medical / Surgical sequence. A comparison between the results of 2004 and 2005 is included.

Table 3. Analysis of Medical Surgical II Grades of Nursing Students in 2004 and 2005

Measurements	2004	2005
Number	49	69
Mean	3.0204082	2.9710145
Standard deviation	0.4325215	0.5933706
Minimum	2.0000000	2.0000000
Maximum	4.0000000	4.0000000

Forty-nine students in the graduating class of the selected school of nursing who passed the NCLEX-RN in 2004 had a mean grade of 3.0204082 on Medical/Surgical II course, with a standard deviation of 0.4325215. The minimum and maximum grade range was 2.0 to 4.0.

Sixty-nine students in the graduating class of students in the nursing school who passed the NCLEX-RN in 2005 had a mean grade of 2.9710145 on Medical/Surgical II course, with a standard deviation of 0.5933706. The minimum and maximum grade range was 2.0 to 4.0. A decline in the mean grade point average from 2004 to 2005 and an increased standard deviation of 0.16 was documented.

Table 4 contains the data related to the cumulative results of student's studies in the Medical / Surgical year long course sequence. A comparison between the results of 2004 and 2005 is included.

Table 4. Analysis of Average of Medical /Surgical I and II Grades of Nursing Students in 2004 and 2005.

Measurements	2004	2005
Number	49	69
Mean	2.9387755	2.9637681
Standard deviation	0.4855479	0.5578243
Minimum	2.0000000	2.0000000
Maximum	4.0000000	4.0000000

Forty-nine students in the graduating class of the selected university nursing students who passed the NCLEX-RN in 2004 had a mean grade of 2.9387755 on Medical/Surgical composite, with a standard deviation of 0.43855479. The minimum and maximum grade range was 2.0 to 4.0.

Sixty-nine students in the graduating class of the selected university nursing students who passed the NCLEX-RN in 2005 had a mean grade of 2.9637681 on

Medical/Surgical composite, with a standard deviation of 0.5578243. The minimum and maximum grade range was 2.0 to 4.0.

Table 5 presents the statistical analysis of the differences of the mean scores of both 2004 and 2005 with reference to the Medical/ Surgical class as a variable associated with student passing scores on the NCLEX-RN.

Table 5. Variable: Medical / Surgical Basic Statistical Measures

Location		Variability	
Mean	2.953390	Std. Deviation	0.52699
Median	3.000000	Variance	0.27772
Mode	3.000000	Range	2.00000
		Interquartile Range	0.50000
Shapiro-Wilk		Pr < w	< 0.0001

When considering both classes of Medical Surgical students in both 2004 and 2005, the mean score was 2.953390. The median and mode were 3.000000 and 3.00000 for medical and surgical scores. A standard deviation of 0.52699 was reported with a variance of 0.27772. The range and interquartile ranges were 2.00000 and 0.50000, respectively.

H_{02}: There are no significant differences between the pre nursing science course (Anatomy and Physiology, Microbiology and Chemistry) grades of students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005. To address this hypotheses, grades of students on both semesters of the Anatomy and Physiology, Microbiology, and Chemistry courses were compared and mean differences, standard deviation, and minimum and maximum ranges were determined.

To address this hypothesis, grades of all science courses were compared and mean differences, standard deviation, and minimum and maximum ranges were determined.

Table 6 contains the data related to the first semester of study in the Anatomy and Physiology sequence. A comparison between the results of 2004 and 2005 is included.

Table 6. Analysis of Anatomy and Physiology I Grades of Students in 2004 and 2005.

Measurements	2004	2005
Number	49	69
Mean	3.1224490	3.2463768
Standard deviation	0.8070691	0.7554858
Minimum	2.0000000	2.0000000
Maximum	4.0000000	4.0000000

Forty-nine students in the graduating class of the selected university in the nursing school who passed the NCLEX-RN in 2004 had a mean grade of 3.1224490 on Anatomy and Physiology I course, with a standard deviation of 0.8070691. The minimum and maximum grade range was 2.0 to 4.0.

Sixty-nine students in the graduating class of the selected university in the nursing school who passed the NCLEX-RN in 2005 had a mean grade of 3.2463768 on Anatomy and Physiology I course, with a standard deviation of 0.7554858. The minimum and maximum grade range was 2.0 to 4.0.

Table 7 contains the data related to the second semester of study in the Anatomy and Physiology sequence. A comparison between the results of 2004 and 2005 is included

Table 7. Analysis of Anatomy and Physiology II Grades of Students in 2004 and 2005.

Measurements	2004	2005
Number	49	69
Mean	3.1428571	3.2608696
Standard deviation	0.7905694	0.7793695
Minimum	2.0000000	2.0000000
Maximum	4.0000000	4.0000000

Forty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2004 had a mean grade of 3.1428571 on Anatomy and Physiology II course, with a standard deviation of 0.7905694. The minimum and maximum grade range was 2.0 to 4.0.

Sixty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2005 had a mean grade of 3.2608696 on Anatomy and Physiology II course, with a standard deviation of 0.7793695. The minimum and maximum grade range was 2.0 to 4.0.

Table 8 contains the data related to the composite grades of students for the Anatomy and Physiology sequence. A comparison between the results of 2004 and 2005 is included.

Table 8. Analysis of Anatomy and Physiology Composite Grades of Students in 2004 and 2005.

Measurements	2004	2005
Number	49	69
Mean	3.1326531	3.2536232
Standard deviation	0.7414478	0.7103395
Minimum	2.0000000	2.0000000
Maximum	4.0000000	4.0000000

Forty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2004 had a mean grade of 3.1326531 on Anatomy and Physiology composite, with a standard deviation of 0.7414478. The minimum and maximum grade range was 2.0 to 4.0.

Sixty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2005 had a mean grade of 3.2536232 on

Anatomy and Physiology II course, with a standard deviation of 0.7103395. The

minimum and maximum grade range was 2.0 to 4.0.

Table 9 presents the statistical analysis of the differences of the mean scores of

both 2004 and 2005 with reference to the Anatomy and Physiology class as a variable

associated with student passing scores on the NCLEX-RN.

Table 9. Variable: Anatomy and Physiology Basic Statistical Measurements

Location		Variability	
Mean	3.203390	Std. Deviation	0.72276
Median	3.000000	Variance	0.52238
Mode	4.000000	Range	2.50000
		Interquartile Range	1.50000
Shapiro-Wilk		Pr < w	< 0.0001

When considering both semesters of Anatomy and Physiology for 2004 and 2005

the mean score was 3.203390. The median was 3.00000 and the mode was 4.000000.

Standard deviation was 0.72276 with a variance of 0.52238. Range and interquartile

range was 2.50000, 1.50000 respectively.

Table 10 presents the data related to the Microbiology course. A comparison

between the results of 2004 and 2005 is included.

Table 10. Analysis of Microbiology course Grades of Students in 2004 and 2005.

Measurements	2004	2005
Number	49	69
Mean	3.2173913	3.1641791
Standard deviation	0.8141265	0.7091825
Minimum	2.0000000	2.0000000
Maximum	4.0000000	4.0000000

Forty-nine students in the graduating class of the selected university school of

nursing who passed the NCLEX-RN in 2004 had a mean grade of 3.2173913 on the

Microbiology course, with a standard deviation of 0.8141265. The minimum and maximum grade range was 2.0 to 4.0.

Sixty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2005 had a mean grade of 3.2536232 on the Microbiology course, with a standard deviation of 0.7091825. The minimum and maximum grade range was 2.0 to 4.0.

Table 11contains the data related to Chemistry course. A comparison between the results of 2004 and 2005 is included.

Table 11. Analysis of Chemistry course Grades of Students in 2004 and 2005.

Measurements	2004	2005
Number	49	69
Mean	3.21916667	3.3382353
Standard deviation	0.7706956	0.6135362
Minimum	2.0000000	2.0000000
Maximum	4.0000000	4.0000000

Forty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2004 had a mean grade of 3.2916667 on the Chemistry course, with a standard deviation of 0.7706956. The minimum and maximum grade range was 2.0 to 4.0.

Sixty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2005 had a mean grade of 3.3382353 on the Chemistry course, with a standard deviation of 0.6135362. The minimum and maximum grade range was 2.0 to 4.0.

Table 12 presents the statistical analysis of the differences of the mean scores of both 2004 and 2005 with reference to the science courses as a variable associated with student passing scores on the NCLEX-RN.

Table 12. Analysis of the composite Science courses: Microbiology and Chemistry Grades of Students in 2004 and 2005.

Measurements	2004	2005
Number	49	69
Mean	3.2653061	3.2608696
Standard deviation	0.6854290	0.5791011
Minimum	2.0000000	2.0000000
Maximum	4.0000000	4.0000000

Forty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2004 had a mean grade of 3.2653061 on the composite science courses: Microbiology and Chemistry scores, with a standard deviation of 0.6854290. The minimum and maximum grade range was 2.0 to 4.0.

Sixty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2005 had a mean grade of 3.2608696 on the composite science courses: Microbiology and Chemistry scores, with a standard deviation of 0.5791011. The minimum and maximum grade range was 2.0 to 4.0.

Table13 presents the statistical analysis of the differences of the mean scores of both 2004 and 2005 with reference to the composite of Microbiology and Chemistry classes as a variable associated with student passing scores on the NCLEX-RN.

Table 13. Variable: Composite of Microbiology and Chemistry Basic Statistical Measures

Location		Variability	
Mean	3.262712	Std. Deviation	0.62262
Median	3.000000	Variance	0.38766
Mode	4.000000	Range	2.00000
		Interquartile Range	1.00000
Shapiro-Wilk		$Pr < w$	< 0.0001

The mean score for two semesters of science, the mean score was 3.262712, with a median and mode of 3.00000 and 4.00000. The standard deviation was 0.62262 with a

variance of 0.38766. The range and interquartile range is 2.00000 and 1.00000 respectively.

H$_{03:}$ There are no significant differences between the cumulative GPA of the students that completed the BSN program at the selected university in 2004 and those that completed the program 2005.

To address this hypothesis, the cumulative GPA of the students graduating in 2004 and 2005 were compared and mean differences, standard deviation, and minimum and maximum ranges were determined.

Table 14 contains the data related to the Cumulative grade point average. A comparison between the results of 2004 and 2005 is included.

Table 14. Analysis of the Cumulative Grade Point Average of Students in 2004 and 2005.

Measurements	2004	2005
Number	49	69
Mean	3.2779061	3.3412652
Standard deviation	0.3025078	0.3604652
Minimum	2.0000000	2.0000000
Maximum	4.0000000	4.0000000

Forty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2004 had a mean grade of 3.2779061 on the composite Science courses: Microbiology and Chemistry scores, with a standard deviation of 0.3025078. The minimum and maximum grade range was 2.0 to 4.0.

Sixty-nine students in the graduating class of the selected university school of nursing who passed the NCLEX-RN in 2005 had a mean grade of 3.3412652 on the composite science courses: Microbiology and Chemistry scores, with a standard deviation of 0.3604652. The minimum and maximum grade range was 2.0 to 4.0.

Table 15 presents the statistical analysis of the differences of the mean scores of both 2004 and 2005 with reference to cumulative grade point average as a variable associated with student passing scores on the NCLEX-RN.

Table 15. Variable: Composite of Cumulative Grade Point Average Basic Statistical Measures

Location		Variability	
Mean	3.314955	Std. Deviation	0.33770
Median	3.318100	Variance	0.114004
Mode	3.190100	Range	1.38850
		Interquartile Range	0.53510
Shapiro-Wilk		Pr < w	< 0.0722

When considering the cumulative grade point average for the nursing program the mean score was 3.314955, with a median of 3.314955, and a mode of 3.190100. The standard deviation for the cumulative GPA was .33770 with a variance of 0.114004. The range and interquartile range for the cumulative GPA was 1.38850 and 0.53510, respectively.

T-Test

The t-test was used to determine whether the means between the variables of the 2004 and 2005 graduation years are significantly different at the selected probability of $<.05$. Results of the t-test for the variables of the 2004 and 2005 graduation years ranged from 0.2581 to 0.9706, indicating there is no significant difference between the grades of the academic variables of the 2004 and 2005 class.

Table 16. T-Test Results

Variable	Pr > t
AP	0.3726
AP	0.3763
SCN	0.9698
SCN	0.9706
MED	0.8008
MED	0.7962
GGPA	0.3173
GGPA	0.3031

The information presented in Tables 17 -29 suggests that there are few differences between the 2 groups of students who graduated in 2004 and 2005 respectively with reference to age, ethnicity and gender. The homogeneity of the population of the selected university is reflected in the following charts and is representative of the traditional student body.

H_{04}: There are no significant differences between the demographic variables of age, ethnicity, or gender between the students who completed the BSN program at the selected university in 2004 and those in 2005.

To address this hypothesis, the demographic variables of age, ethnicity and gender of the students graduating in 2004 and 2005 were compared and mean differences, standard deviation, and minimum and maximum ranges were determined.

Table 17. Descriptive Statistics for Gender by Graduation Year 2004

Frequency	Percent	Cum. Frequency	Cum. Percent
3	6.12	3	6.12
46	93.88	49	100.00

For the year 2004, 3 males and 46 females were in the nursing program, cumulative frequency and percent for male was 3, and 6.12. Cumulative frequency and percent for female was 49 and 100 for the female population.

Table 18. Descriptive Statistics for Ethnicity-Asian /Caucasian by Graduation Year 2004

Frequency	Percent	Cum. Frequency	Cum. Percent
1	2.04	1	2.04
48	97.96	49	100.00

For the year 2004, the ethnicity of the nursing student population was 1 Asian and

48 Caucasians. Cumulative frequency and cumulative percent for the Asian population

was 1, and 2.05%, respectively. Cumulative frequency and cumulative percent for the

Caucasian population was 49 and 100% respectively.

Table 19. Pass/Fail Rate of Students NCLEX-RN Scores by Graduation Year 2004

Frequency	Percent	Cum. Frequency	Cum. Percent
2	4.08	2	4.08
47	95.92	49	100.00

For the year 2004, 2 of the students failed the NCLEX-RN and 47 students passed

the NCLEX-RN. In the 2004 class, 4.08% of the nursing students taking the NCLEX-RN

failed the examination, cumulative frequency and cumulative percents were 2 and 4.08%

respectively. In the 2004 class, 95.92% of the nursing students taking the NCLEX-RN

passed the examination, cumulative frequency and cumulative percents were 49 and

100% respectively.

Table 20. Descriptive Statistics for Gender by Graduation Year 2005

Frequency	Percent	Cum. Frequency	Cum. Percent
3	4.35	3	4.35
66	95.65	69	100.00

For the year 2005, 3 males and 66 females were in the nursing program,

cumulative frequency and cumulative percent for student male population was 3, and

4.35%. Cumulative frequency and cumulative percent for the student female population

was 69 and 100% respectively.

Table 21. Descriptive Statistics for Ethnicity-African / Asian / Caucasian / International by Graduation Year 2005

Frequency	Percent	Cum. Frequency	Cum. Percent
2	2.94	2	2.94
2	2.94	4	5.88
62	91.18	66	97.06
2	2.94	68	100.00

For the year 2005, the ethnicity of the nursing student population was 2

African–American, 2 Asian, 62 Caucasians and 2 International. Cumulative frequency

and cumulative percent for the African-American population was 2, and 2.94%,

respectively. Cumulative frequency and cumulative percent for the Asian population was

4 and 5.88% respectively. Cumulative frequency and cumulative percent for the

Caucasian population was 66 and 97.06% respectively. Cumulative frequency and

cumulative percent for the International population was 68 and 100% respectively.

Table 22. Pass/Fail Rate of Students NCLEX-RN Scores by Graduation Year 2005

Frequency	Percent	Cum. Frequency	Cum. Percent
13	18.84	13	18.84
53	81.16	69	100.00

For the year 2005, 13 of the students failed the NCLEX-RN and 53 students

passed the NCLEX-RN. In the 2005 class, 18.84% of the nursing students taking the

NCLEX-RN failed the examination, cumulative frequency and cumulative percents were

13 and 18.84% respectively. In the 2005 class, 81.16% of the nursing students taking the

NCLEX-RN passed the examination, cumulative frequency and cumulative percents were

69 and 100% respectively.

Table 23. Descriptive Statistics Table for Age by Graduation Year 2004 and 2005.

Age	2004	2005
Number	49	67
Mean	23.3469388	23.7462687
Standard Deviation	4.0852939	5.1942371
Minimum	20.000000	18.000000
Maximum	48.000000	54.000000

For 49 students in the 2004 graduation class the mean age of the students was

23.3469388, with a standard deviation of 4.0852939 years. The ages ranged from 20 to

48 years. The mean age for 67 of the 69 students in the 2005 class was 23.7462687 with a

standard deviation of 5.1942371(two of the student ages were not reported). The ages of

the nursing students at graduation ranged from 18 to 54 years.

The following tables represent a different format of the descriptive data, results

are reported above.

Table 24. Descriptive Statistics Table for Gender/Male by Graduation Year 2004 and 2005.

Gender/Male	2004	2005
Frequency	3	3
Percent	6.12	4.35
Cumulative Frequency	3	3
Cumulative Percent	6.12	4.35

Table 25. Descriptive Statistics Table for Gender/Female by Graduation Year 2004 and 2005.

Gender/Female	2004	2005
Frequency	46	66
Percent	93.88	95.65
Cumulative Frequency	49	69
Cumulative Percent	100	100

Table 26. Descriptive Statistics Table for Ethnicity: African-American by Graduation Year 2004 and 2005.

Ethnicity: African-American	2004	2005
Frequency	0	2
Percent	0	2.94
Cumulative Frequency	0	2
Cumulative Percent	0	2.94

Table 27. Descriptive Statistics Table for Ethnicity: Asian by Graduation Year 2004 and 2005.

Ethnicity: Asian	2004	2005
Frequency	1	2
Percent	2.04	2.94
Cumulative Frequency	1	4
Cumulative Percent	2.04	5.88

Table 28. Descriptive Statistics Table for Ethnicity: Caucasian by Graduation Year 2004 and 2005.

Ethnicity: Caucasian	2004	2005
Frequency	48	62
Percent	97.96	91.18
Cumulative Frequency	49	66
Cumulative Percent	100.0	97.06

Table 29. Descriptive Statistics Table for Ethnicity: International by Graduation Year 2004 and 2005.

Ethnicity: International	2004	2005
Frequency	0	2
Percent	0	2.94
Cumulative Frequency	0	68
Cumulative Percent	0	100

Descriptive statistics for this study found no significant relationship of demographic variables to success on the NCLEX-RN for the students at Liberty University for both the 2004 and 2005 years.

Relationship of Variables to NCLEX

A logistic regression model established the relationship between the NCLEX, a dichotomous variable and the independent variables. (Beeman et al 2002; Percoco, 2001; Schmidt, 2000). A stepwise model selection method was employed.

To reduce the effects of multicollinearity among the variables, principle components procedure was run with the use of SAS software. A stepwise model selection was run on the principle components and the remaining variables. A significant level of 0.1 was used for entering and 0.15 for leaving the model. The resulting model was:

$$G(Prin1, G\ year) = 3.4888 + 0.5824(Pr\ in1) - 1.793\ (Gyear),$$

The wald tests was used to test for the significance of the model and to test individual coefficient. Hosmer-Lemeshow goodness of fit statistic tested model fitness.

Levels of significance for the results was established at $p < 0.05$.

Table 30. The Principle Component Correlation Matrix

Courses	AP	SCN	MED	CGPA
AP	1.000	0.5165	0.4010	0.7102
SCN	0.5165	1.000	0.3763	0.7006
MED	0.4010	0.3763	1.0000	0.7138
CGPA	0.7102	0.7006	0.7138	1.0000

From the principle component correlational matrix above, AP, SCN, Med and CGPA were found to be highly correlated. These variables entered as principle components 1 into the stepwise logistics regression model.

Summary of the results of the logistic regression analysis were:

Table 31. Summary of Logistic Regression Analysis

Step	Entered	DF	In	Chi-Square	Pr>
1	Princ 1	1	1	8.3303	0.0039
2	Gyear	1	2	5.9010	0.0151

Results of the model were: Variables identified in the principle component 1 (Anatomy and Physiology, Medical Surgical, and Graduation GPA) were identified (p> 0.0039) as predictors for the NCLEX for the 2004 and 2005 class. The G year, identified students in the 2004 class having a higher probability (p> 0.0151) of passing the NCLEX-RN than the students in the 2005 class.

5. SUMMARY AND DISCUSSION

Fifteen percent of the 2005 nurses graduating from the BSN program at Liberty University failed the NCLEX-RN examination after the completion of a board certified program. Identifying qualified students in the baccalaureate program enhances the efficiency of the program, reduces budgetary expenses and decreases the risk of losing accreditation for the nursing program. Furthermore, it produces qualified nurses prepared to pass the National Council Licensure Examination (NCLEX-RN) and enter the nursing field. Any information that can assist the nursing faculty with the instructional processes is a valuable tool. This final chapter will restate the research problem and briefly review the major methods used in the study. The focus of this chapter is to summarize the results and discuss the findings and implications of the study. Limitations of the study are included, along with recommendations for the additional research.

Statement of the Problem

At a faith-based university, there were documented differences in the pass rate of graduates who took the NCLEX-RN in 2004 and in 2005. Pass rates for the year 2004 and 2005 were 96% and 81% respectively. This 15% decline created the need to identify program variables related to the student's successful performance on the test.

The study was designed to analyze the following selected variables, grades in selected nursing courses between the two years, core curriculum grades of the nursing students, cumulative grade point averages and the demography of the students.

Review of the Methodology

A causal comparative study using the archival data retrieved from records of the 2004 and 2005 nursing graduates provided the basis of the methodology. Data collection

included 118 student records, demographic variables and grades on selected science courses, selected nursing courses and graduation GPA.

After the development of null hypotheses, the researcher identified a level of significance as $p < .05$. Four null hypotheses addressed these problems. Descriptive statistics were computed for each independent variable. Frequency tables were established using the categorical variables: gender, ethnicity, age and NCLEX-RN for each year. After determining the mean, a comparison of each numerical variable by year was computed using the t-test. Further logistic regression analysis and principle component analysis to reduce multicollinearity completed the statistical analysis and produced the results.

Summary of the Results

Four null hypotheses are presented for summary.

H_{01}: There are no significant differences between the nursing course (Medical/Surgery) grades of students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

This variable was found to be statistically significant at $> .05$, therefore the null hypothesis was accepted. Logistic regression results were found to be $p < 0.05$. It was therefore concluded that while student grades for the Medical / Surgical courses at the university are related to success on the NCLEX-RN they were not found to be related to the difference in the pass / fail scores of the NCLEX between the two class years.

H_{02}: There are no significant differences between the pre nursing science course (Anatomy and Physiology, Microbiology and Chemistry) grades of students who

completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

Analysis of pre nursing science course grades for two semesters for the years 2004 and 2005 resulted in a statistically significant difference at $p > .05$. The null hypothesis was accepted. Logistic regression results were found to be $p<0.05$. It was therefore concluded that while student grades for the pre nursing science course grades at the university are related to success on the NCLEX-RN they were not found to be related to the difference in the pass / fail scores of the NCLEX between the two class years.

$H_{03:}$ There are no significant differences between the cumulative GPA of the students that completed the BSN program at the selected university in 2004 and those who completed the program 2005.

Descriptive analysis of cumulative GPA and the t-test was greater than the accepted p value. Therefore, the null hypothesis is accepted. There were no significant differences in cumulative grade point averages between the 2004 and 2005 classes. Logistic regression results were found to be $p<0.05$. It was therefore concluded that while student GPA at the university are related to success on the NCLEX-RN they were not found to be related to the difference in the pass / fail scores of the NCLEX between the two class years.

H_{04}: There are no significant differences between the demographic variables of age, ethnicity, or gender between the students who completed the BSN program at the selected university in 2004 and those who completed the program in 2005.

Results based on statistics analysis reflect homogeneity among the university nursing student body. There were no statistically significant demographic variables

related to student success on the NCLEX-RN for the years 2004 and 2005. The null

hypothesis is accepted.

Discussion

Interpretation of the findings

This study found no significance difference between variable course grades of the

2004 students passing the NCLEX or the 2005 students passing the NCLEX. The

significance of cognitive and non-cognitive variables from this study is consistent with

findings from similar studies. Grades earned in Anatomy and Physiology (A&P) were

found to be significant related to the pass rate on the NCLEX in this study as well as

other studies (Glick, et al. 1986; Griffith et al. 1995; Percoco, 2001; Quick et at. 1985;

Waterhouse, 2001). Anatomy is the study of the basic organization of the body and the

relationship of anatomical structures. Physiology is the study of body functions in a

homeostatic environment. Therefore, these two courses like other science related courses

provide the foundations required for a medical vocation. Previous studies suggest the

importance of making a B or better in these courses decrease the risk of failure on the

NCLEX-RN. In a correlational study by Waterhouse (2001), the researcher found

significance in the A&P grade and the required secondary pathophysiology course. The

researchers suggested that a mandatory B for the A&P courses is necessary for success.

In the analysis of the student grades for this study, the mean for Anatomy and Physiology

was 3.203 with a standard deviation of 0.72276. While is a B average, it still indicates a

small portion of the nursing population earned a C in the course. In 2001, Beeman and

Waterhouse use a RAI, a risk assessment instrument, to identify students with a high

probability of failure. The study noted that with every C grade earned in nursing theory

classes, the loading on the RAI instrument increased, meaning the results indicate an increase in failure rate for the NCLEX-RN. In another study by Barkley et al., (1998) indicators of failure on the NCLEX-RN were related to number of C grades or lower. Grades of C resulted in a 15% NCLEX-RN failure rate. This was projected to increase to 44% NCLEX-RN failure when three Cs were earned during the nursing program.

Previous studies have concluded that nursing course and GPA as variables are significant in the identification of student success (Barkley, Dufour & Rhodes, 1998; Campbell & Dickson, 1996; Drake & Michael, 1994; Glick et al, 1986; Krupa, Quick & Whitley, 1988; McKinney, Small, O'Dell, & Coonrod, 1988; and Woodham & Taube, 1986). Several studies used the results of their research to predict success rate at 80 to 95%. However, limited studies were able to predict the probability of student failure on the NCLEX-RN with the same accuracy. Therefore, research remains inconsistent in the ability to identify student pass/fail rate with any degree of accuracy.

With the implementation of the NCLEX in 1988, a higher passing score was established and the results were reported as pass/fail. Previously statistical studies produced poor predictive outcomes and did not account for dichotomous data or multicollinearity. NCLEX-RN studies since 2000 have overcome these problems. However, the NCLEX-RN content changes every three or four years and the need to establish a consistent method of testing and identifying variables remains a problem.

Relationship of the current study to previous research

While the purpose of the study was to identify predictive variables that identify success in program completion and nursing state boards, it is also an important tool for program development.

All nursing programs undergo a recruitment process to select the best possible candidate for each new class. With each selection of students, other students are excluded from the highly competitive and tightly regulated program. In the event a student is selected that is unable to complete the program, the nursing program has sacrificed a valuable student position, incurred a financial loss to the institution, and jeopardized their accreditation. Identification of variables necessary for student success on the NCLEX-RN is an essential goal for research.

Although numerous studies have attempted to identify predictors, only a few have proved reliable over time (Crow, Handley, Morrison, & Shelton, 2004). The literature is inconsistent as to which, if any, of the variables can be generalized to other programs. Previous studies have developed models for identifying predictive variables within the nursing program and for identifying at risk students, allowing for early intervention (Beeson & Kissling, 2001). The risk assessment instrument (RAI) proposed by the NCLEX-RN organization has been tested by other schools with significant results (Barkley et al., 2001). At this point, however, there are insufficient findings to generalize results and tests from one study to another. This study suggests that there are identifiable variables that can be part of an alert system for administrators responsible for nursing programs.

The current concern about decreasing NCLEX-RN scores and limited ability to identify cognitive variables has led to a more critical evaluation of the needs of students and nursing administrators to identify variables other than academic variables as indicators of NCLEX-RN success. Given poor study results, difficulty in statistical analysis because of dichotomous scoring on the NCLEX-RN, and the questionable

validity of the NCLEX-RN, nursing schools are seeking other means of identifying other variables.

Mosby Assess Test and National League for Nursing Comprehensive Achievement Test for Baccalaureate Students (NLNCATBS) have shown to be somewhat helpful in identification of variables. Several recent studies indicate this may a better direction for identification of student success.

Recommendation for Educators

Because results found in one study are unique to one program, this study would suggest the need for each nursing program to establish a model that is reflective of its own curriculum.

Educators should monitor the minority student population within its nursing programs. Minority students often use English as a second language and have difficulty with the English within required nursing courses. Therefore, as the number of minority students increases within a nursing program, the program may experience increased risk of NCLEX-RN failure.

Suggestions for Additional Research

Based on the findings of this study, the following recommendations are presented for consideration by other investigators exploring the relationships between variables that can identify student pass/ fail scores on the NCLEX-RN.

1.   Additional research should be undertaken at various time intervals to insure the currency of the variables and predictive models. This recommendation is particularly important in view of the NCLEX-RN content changes every three to four years;

2.   Non-cognitive demographic variables should be collected for an

updated analysis of the nursing school population and used for early

intervention of students;

3.   Additional research should focus on non-cognitive variables as

indicators of student success or failure on the NCLEX-RN;

4.   Transfer courses should be part of future studies and strategies for

nursing program success; and

5.   On going studies for four-year BSN programs should be conducted to

add to the existing body of literature and address success on the

NCLEX-RN.

Limitations of the Study

Data were collected using nursing school records and Registrar records from a

private, faith-based university. The sample included records for a two-year period for

students who graduated with a BSN degree. A limited number of non-cognitive variables

were used for the study. Transfer courses were accepted without review of course.

Conclusions

There are predictor variables that can be used to identify student success on the

NCLEX-RN. Based upon the findings, administrators have at their disposable an

instrument that can increase the probability of both student and program success.

Program and student success are linked to one another and depend on each other for

success. Nursing shortages and scarce resources require that administrators continue to

study and implement methods for improving program completion and licensure

examination success.

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APPENDIX A – APPLICATION TO NURSING PROGRAM

LIBERTY UNIVERSITY - DEPARTMENT OF NURSING
APPLICATION FOR ADMISSION
Biographical Fact Sheet

Full Name:_____
　　　　　　　　First　　　　　　　　　Middle/Maiden　　　　　　　Last

Social Security No. _____   Transfer Student? Yes _____ No _____

If Applicable: LU Box# _____LU Phone # _____Cell Phone#_____

Email address (Please write clearly)_____

Home (permanent) Address:_____

_____

Home Phone:_____Date of Birth: _____

Place of Birth: _____

Significant other to be contacted in case of emergency:

Name　　　　　　　　　　　　　Relationship　　　　　Phone #

Please indicate completion of the following courses:
BIOL 211　　Anatomy & Physiology I　　Taken where ?_____ Grade_____
BIOL 212　　Anatomy & Physiology II　　Taken where?_____ Grade_____
CHEM 107　　General Chemistry　　　Taken where?_____ Grade_____
NURS 101　　Introduction to Nursing　　Taken where?_____ Grade_____
NURS 105　　Medical Terminology　　Taken where?_____ Grade_____

I am sending transcripts from the following schools:

(Liberty University transcripts must be requested through the Registrar's Office and sent to the Nursing Dept)

Fill in the names of two persons from whom you have requested a recommendation:

_____　　_____

I HEREBY FORMALLY REQUEST ADMISSION TO THE BACHELOR OF SCIENCE IN NURSING MAJOR AT LIBERTY UNIVERSITY.

APPENDIX B - NURSING COURSE SEQUENCE

BACHELOR OF SCIENCE in NURSING - NURSING
SUGGESTED COURSE SEQUENCE

FRESHMAN YEAR

First Semester		Second Semester	
ENGL 101	3	ENGL 102	3
BIOL 211	4	BIOL 212	4
PSYC 200	3	CHEM 107	4
MATH 201	3	NURS 105	1
NURS 101 or 325	1	CHMN 101	2
GNED 101	1	GNED 102	1
TOTAL	15	TOTAL	15

SOPHOMORE YEAR

NURS 210	2	NURS 221	4
NURS 215	3	ENGL LIT	3
COMS 101	3	FACS 330	3
BIOL 203	4	PSYC 210	3
BIBL 105	3	BIBL 110	3
CSER 537	0	CSER 537	0
TOTAL	15	TOTAL	16

JUNIOR YEAR

NURS 301	5	NURS 302	5
NURS 352 or 353	4	NURS 352 or 353	4
NURS 305	2	NURS 306	2
HUMN 101/LANG	3	CRST 290	2
CSER 537	0	PHIL 201	3
TOTAL	14	CSER 537	0
		TOTAL	16

SENIOR YEAR

NURS 415/416/417/418	3	NURS 490	3
NURS 440	5	NURS 451	3
HIST ___	3	NURS 460	4
THEO 201	3	NURS 475	3
Elective (PHIL 380)	3	THEO 202	3
CSER 537	0	CSER 537	0
TOTAL	17	TOTAL	16

Graduation Requirements for B.S.N in Nursing

120 Total Hours

    1. 30 hours of upper level (300/400) courses
    2. 30 semester hours completed at Liberty
    3. 50% of the major and the minor must be completed at Liberty

Cumulative GPA must be 2.0 or higher

    4. "C" or above in upper level courses in the major
    5. Must have an overall average of "C" in the major

Christian/Community Service Assignments

    6. One semester of Christian/Community Service (CSER) must be completed for each semester in
        which the student is registered for 12 or more hours. After completing GNED 101 and GNED 102 in the
        first year at Liberty, any student may choose his area of Christian/Community Service from the 200,
        300, 400, or 500 series.

In addition to the requirements listed on the front, the above stipulations must be met.

AS 08/27/03 bsn/nurs 2

APPENDIX C – CONSENT FORM

Dr. Dee Britt
Department of Nursing
1971 University Boulevard
Lynchburg Virginia 24506

Dear Dr. Britt,

Thank you so much for the opportunity to work with you and the nursing department in the collection of data for my dissertation. This letter will serve as an approval for the study we mentioned via telephone conversation.

As a reminder, the study will utilize data collected from the nursing department records for the 2004 and 2005 graduation class. It will include selected pre admission variables, nursing classes, GPAs, sociodemographics and NCLEX scores from student records.

I have submitted an IRB form to the University and received permission to proceed with the data collection. I assure you that student confidentiality will be preserved and honored.

The results of the study will be available upon completion of the study. It is my hope that it will be of benefit to the nursing department in the selection of students into the program, and as a means of helping potential students that may need academic assistance. The results of the study should also shed light as to possible reasons for the decrease in the 2005 NCLEX pass rate.

Thank you so much for your support. Your signature below indicates your approval for this study.

Respectfully,

Lois Brewer Borek

_____

Department Chair Dee Britt, School of Nursing

Telephone conservation/ October 2005

APPENDIX D – INSTITUTIONAL REVIEW BOARD APPROVAL

_____   _____
Your Signature   **Date**

_____   _____
Faculty Advisor's Signature   **Date**

Return Completed & Signed Form to:
Dr. Fred Milacci, Director
Graduate Center for Research and Evaluation Liberty University
CN 2400 U/1971 University Blvd./Lynchburg, VA 24503
Phone: (434) 592-4043/email: GCRE@liberty.edu

Recommendation of Research Consultant:

Accepted: ___✓___ Provisional Acceptance: _____ Denied: _____

Comments/Suggestions from GCRE Research Representative:

_____   _____
GCRE Signature   **Date**

APPENDIX E – STUDENT DATA SHEET

Student Study Code No. _____

DEMOGRAPHIC DATA

Graduation year   _____   Sex (circle one) M   F
Age at graduation _____

Ethnicity:
        Caucasian   _____
        African- American   _____
        Latino   _____
        Asian   _____
        Other   _____

PRE-ADMISSION VARIABLES

High School GPA   _____
SAT score:
        Verbal   _____
        Math   _____

Grades in Science Classes   Letter Grade

1. BIOL 211 Anatomy   _____
2. BIOL 212 Anatomy   _____
3. BIOL 203 Microbiology   _____
4. CHEM107 Chemistry   _____

5. Cumulative Science GPA: _____
  (1-4 Sciences Courses)

Grades in Nursing Classes   Letter Grade

6. NURS 301 Medical Surgery   _____
7. NURS 302 Medical Surgery   _____

8. Did this student participate in the NCLEX Kaplan review course?   Yes _____   No ___

9. Previous degrees_____
10. Graduation GPA _____

11. Number of semesters to complete program from admission into nursing program_____.
12. Completion of the nursing curriculum   Yes _____   No _____
13. Successful completion of the NCLEX   Yes _____   No _____

APPENDIX F – ACADEMIC STATUS SHEET

LIBERTY UNIVERSITY   ACADEMIC STATUS SHEET

COLLEGE: ARTS & SCIENCES   **NURSING**

DEGREE: BACHELOR OF SCIENCE in NURSING

NAME (Last, First, Middle)

_____   Email _____

STUDENT   PLANNED
NUMBER_____ADVISOR_____ BOX_____YEAR OF GRADUATION_____

GENERAL EDUCATION REQUIREMENTS (56 hours)
All General Education courses must be chosen from the list
of "Approved General Education Courses"
(www.liberty.edu/academics/general/)

FOUNDATIONAL STUDIES (16 hours)
Must be completed within the first 45 hours of a
student's program. Transfer students must complete
within their first year at Liberty.

Course	hrs.	sem. taken	grade
ENGL 101	3		
ENGL 102	3		
COMS 101	3		
MATH 201	3		
**GNED 101	1		
**GNED 102	1		
CHMN 101	2		

**RN to BSN students taking NURS 325 and NURS 350 are not
required to take GNED 101 and GNED 102 but **must take** PHIL
380.

INVESTIGATIVE STUDIES (40 hours)

Course	hrs.	sem. taken	grade
ENGL 201, 202, 215, 216 221, or 222	3		
BIOL 211	4		
++NAT SCI/MATH/ or CMIS 201	3		
HISTORY_____	3		
PSYC 210	3		
SOC SCI_____	3		
HUMN 101/LANG	3-6		
**GEN ED ELEC	3-0		
PHIL 201	3		
THEO 201	3		
THEO 202	3		
BIBL 105 or 205	3		
BIBL 110 or 210	3		

++May be met by some support courses.

**Choose from Fine Arts/LANG/Nat Sci/Math/CSCI/Soc
Sci./CMIS 201

NOTE: See list of "Approved General Education Courses."
(www.liberty.edu/academics/general/)
Liberty Home Page - Academics - College of General Studies -
General Education & Integrative Courses

AS 10/29/03 bsn/nurs 1

MAJOR: NURSING (56 hours)

Course	hrs.	sem. taken	grade
#NURS 101 or 325	1		
NURS 105	1		
NURS 210	2		
NURS 215	3		
NURS 221	4		
NURS 301	5		
NURS 302	5		
NURS 305	2		
NURS 306	2		
NURS 352	4		
NURS 353	4		
NURS 415, 416, 417 or 418	3		
NURS 440	5		
NURS 451 or 350	3		
NURS 460	4		
NURS 475	3		
+NURS 490	3		

#RN's must choose NURS 325 and 350
+Prerequisite PHIL 380

SUPPORT COURSES (15 hours) See NOTE 1

	hrs.	sem. taken	grade
CHEM 107	4		
BIOL 203	4		
BIOL 212	4		
FACS 330	3		

NOTE 1: Total hours will be determined by choices in
General Education

ELECTIVES (See NOTE 1 above) CRST 290, FRSM 101 and
INFT courses may be counted for elective credit.

GRADUATION REQUIREMENTS
CRST 290   2
FRSM 101   1   REQ.___   MET__
Technology Competency   MET___ _____
   Word Processing   (Test or Class(es))
   Spreadsheets
   Operating Systems
   Internet

TOTAL -- 122 hours minimum required.
        (Of this total, at least 42 hours
        must be 300/400 level courses.)

Foundational Studies, Technology Competency, and 2.0 GPA are required to declare a major. (Please note, some majors have