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Academic and Non-academic Variables as Predictors of NCLEX-RN Success Among Traditional Associate Degree Students at Southern Adventist University

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ABSTRACT

ACADEMIC AND NON-ACADEMIC VARIABLES AS PREDICTORS OF
NCLEX-RN SUCCESS AMONG TRADITIONAL ASSOCIATE
DEGREE STUDENTS AT SOUTHERN
ADVENTIST UNIVERSITY

by

Christine Moniyung

Chair: Larry D. Burton

ABSTRACT OF GRADUATE STUDENT RESEARCH

Dissertation

Andrews University

School of Education

Title: ACADEMIC AND NON-ACADEMIC VARIABLES AS PREDICTORS OF NCLEX-RN SUCCESS AMONG TRADITIONAL ASSOCIATE DEGREE STUDENTS AT SOUTHERN ADVENTIST UNIVERSITY

Name of researcher: Christine Moniyung

Name and degree of faculty chair: Larry D. Burton, Ph.D.

Date completed: July 2015

Problem

The School of Nursing at Southern Adventist University offers both Associate of

Science and Bachelor of Science in nursing degrees. A majority of the students who sit

for the NCLEX-RN are associate of science in nursing graduates. The pass rate dropped

from 94.9% in 2010 to 88.8% in 2011. The pass rate went up to 93.3% in 2012, but

dropped again by almost 5% in the following year, and to an all-time low of 76.5% in

2014.

Unlike most AS nursing program student populations in the nation, the majority

of SAU students are young and considered traditional-age college students. A greater

understanding of nursing student characteristics that potentially influences NCLEX-RN

outcomes for this unique population of traditional undergraduates could result in the attraction of younger students into the nursing profession and ultimately entering the nursing workforce. No specific and current peer-reviewed studies were found in the Review of Literature that correlate associate degree nursing program admission criteria among traditional-age college students, such as those at Southern Adventist University.

Purpose

The purpose of this study was to identify academic and non-academic factors that may predict NCLEX-RN success on first attempt among nursing graduates who completed the associate of science nursing program at Southern Adventist University.

Methodology

A total of 838 student records were entered into the final cohort in this study. Logistic regression and Chi-square test were utilized to answer research questions for this study. A descriptive statistical analysis of the demographic data was also performed evaluate the academic and non- academic variables of the sample population.

Results and Conclusions

The study identifies that predictors of NCLEX-RN success in this study sample are ethnicity and three of the eight core nursing courses: Adult Health III, Mental Health, and Adult Health I. Ethnicity is a substantive negative predictor variable in all models. The study demonstrates Hispanic and Black students are less likely to pass the NCLEX-RN than Caucasian students.

Successful NCLEX-RN outcomes among traditional students will not only add younger nurses to an increasingly older nursing workforce and help ease the anticipated

RN shortage, but it will also provide additional information to the body of literature on these complex issues.

Andrews University

School of Education

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A Dissertation

Presented in Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

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APPROVAL BY THE COMMITTEE:

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Chair: Larry D. Burton   Dean, School of Education
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Member: Jimmy Kijai

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Member: Cynthia Swafford

_____   _____
External: Karen Allen   Date approved

This dissertation is dedicated to my family, whose unwavering love and encouragement made this journey possible, and to the memory of my loving parents, who passed on a passion for learning

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CHAPTER I

INTRODUCTION

Background of the Study

Nursing Shortage

As the largest workforce in healthcare (Bureau of Labor Statistics, 2013), nurses in the United States are involved in managing patient care and making critical decisions that impact patient outcomes. Their knowledge and skills play a vital role to ensure patient safety and excellence in nursing care. Several studies have projected an increased need for nursing professionals in the near future. The Bureau of Labor Statistics (2013) data estimated that employment of registered nurses (RNs) will grow from 2,711,500 in 2012 to 3,238,400 in 2022. Add to this projected demand the potential need for workforce replacements, and one million more jobs for RNs could become available by 2022 (Bureau of Labor Statistics, 2013). According to the Bureau of Labor Statistics (2014a), factors such as advances in medical technology and an increasingly older American population across the United States have created a steady demand for RNs. Furthermore, passage of the Affordable Care Act in November 2013 has generated greater access to healthcare, which in turn will create a growing need for providers, including RNs (Health Resources and Services Administration, 2014; Tillet, 2011; Wakefield, 2010).

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According to the Health Resources and Services Administration (2014), nearly three million RNs were actively working in 2012, and that number is expected to increase by 33% within the next 10 years. However, despite a potential increase in the RN workforce, the United States is still facing a nursing shortage, especially in the South and in the West (Health Resources and Services Administration, 2014). Another study by Buerhaus, Aurbach, and Staiger (2009) projected nursing shortages that will grow to an estimated 260,000 by 2025. Several factors have contributed to nursing supply and demand issues. One factor of concern is the increasingly older nursing workforce in this country (Buerhaus, Donelan, Ulrich, Norman, & Dittus, 2006; Health Resources and Services Administration, 2013). Since most nurses simply do not remain in the workforce as they get older (Health Resources and Services Administration, 2010), a national nursing shortage is an area of concern with serious consequences to patient safety and the quality of healthcare in this country. The Health Resources and Services Administration (2010) reported that the median age of the RN workforce has increased from 38 years old in 1988 to 46 years old in 2008. Based on the *American Community Survey* demographic projection, it is estimated that "over the next 10 to 15 years, the nearly 1 million RNs older than 50—about one-third of current workforce—will reach retirement age" (as cited in Health Resources and Services Administration, 2013, p. 22). Yet while there was a sharp increase in the number of RNs between the ages of 23 and 26 entering the workforce between 2002 and 2009 (Auerbach, Buerhaus, & Staiger, 2011), the projected RN shortage is increasingly steady, especially in certain regions of the country (Health Resources and Services Administration, 2014).

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In a survey by Health Resources and Services Administration (2010), RN respondents listed various factors such as workplace concerns, personal or family issues, and retirement as reasons for not working. Personal family factors—such as childcare, in particular—was the top reason for not working given by participants under age 50. Retirement, however, was listed as the number one reason for not working by participants age 50 and older. Another study revealed that the incentive to stay in nursing is compromised by job burnout and job dissatisfaction (Aiken, Clarke, & Sloane, 2002).

A nursing shortage is often compounded by the inability of nursing programs to accept more qualified applicants. According to the American Association of Colleges of Nursing (AACN), "U.S. nursing schools turned away 75,587 qualified applicants from baccalaureate and graduate nursing programs in 2011 due to [an] insufficient number of faculty, clinical sites, classroom space, and clinical preceptors, as well as budget constraints" (Rosseter, 2012, p. 3). A majority of the baccalaureate and graduate nursing programs that participated in the survey cited a lack of qualified nurse educators as their main reason for rejecting many applicants who meet the admission criteria (Rosseter). Likewise, a lack of locations for clinical practice was cited as the main issue preventing Associate of Science (AS) nursing degree programs from accepting additional qualified students (Kaufman, 2013). However, the impetus to ameliorate a nursing shortage by increasing enrollment may lead to unintended consequences. Further discussion of the unintended consequences of this practice will be presented in the Literature Review.

Due to changes in the nation's healthcare policy and/or nursing roles (Health Resources and Services Administration, 2014; Tillet, 2011; Wakefield, 2010), the aging population and an increasingly older RN workforce (Bureau of Labor Statistics, 2014a), a

national nursing shortage will remain a threat. Researchers have warned that dire consequences, resulting in compromised patient safety and the overall quality of the healthcare delivery system, will ensue (Aiken et al., 2002; Aurbach, Buerhaus, & Staiger, 2007; Buerhaus, Donelan, Ulrich, Norman, DesRoches & Dittus, 2007; Stanton & Rutherford, 2004).

Minimum Competency

Because nurses are involved in making countless decisions that impact patient outcomes, their role is vital to the overall quality of the healthcare delivery system. Successful completion of a nursing program, however, is not all that is required of nursing graduates. In order to guard public safety, graduates from approved nursing programs in the United States must also pass the National Council Licensure Examination for Registered Nurses (NCLEX-RN) as a demonstration of minimum competency before they can be licensed as registered nurses (National Council of State Boards of Nursing, 2013c). The National Council of State Boards of Nursing (NCSBN) is "an independent not-for-profit organization" (National Council of State Boards of Nursing, 2013a) responsible for setting the minimum passing standard for all eligible pre-licensure nursing graduates in the United States (National Council of State Boards of Nursing, 2013d).

Nursing Programs Accreditations

The ability of an educational institution's pre-licensure nursing graduates to pass the NCLEX-RN on their first attempt has become a major requirement for maintaining program approval by many state boards of nursing. Additional standards for nursing-

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candidate licensure and the approval of academic nursing programs are also dictated by each governing state board of nursing (O'Neill, Marks, & Reynolds, 2005). The Tennessee Board of Nursing, for example, will place a nursing program under probation or sanction if its students' annual NCLEX-RN pass rate drops below 85% (*Tennessee Board of Nursing Position Statements*, 2012). Failure to maintain an acceptable NCLEX-RN pass rate may also jeopardize a nursing program's accreditation status from an independent accrediting body. The *ACEN Accreditation Manual* for associate programs has listed the students' performance on the nursing licensure examination as a sub-criterion in its evaluation of pre-licensure nursing programs (Accreditation Commission for Education in Nursing, 2013). According to the guideline, "The Program's three-year mean for the licensure examination pass rate will be at or above the national mean for the same three-year period" (p. 6).

Various educational paths are available to individuals in the United States who seek to obtain pre-licensure nursing education to become registered nurses. The most common routes are associate and baccalaureate nursing programs, but other options, such as fast-track baccalaureate or master's degree programs, are also available for students with a non-healthcare background. A 2008 survey of RNs found that an Associate of Science (AS) nursing degree offered through community colleges was the top entry-level nursing education for most RNs in the United States (Health Resources and Services Administration, 2010). The *Annual Survey of Schools of Nursing, Academic Year 2011-2012* by the National League for Nursing (NLN) also found that two-thirds of all pre-licensure RN students were completing their nursing education in associate degree programs (Kaufman, 2013).

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Problem Statement

The School of Nursing at Southern Adventist University (SAU) offers both Associate of Science (AS) and Bachelor of Science (BS) in nursing degrees. A majority of the students who sit for the NCLEX-RN are associate of science in nursing graduates. More than half of the school's AS graduates have continued to pursue their BSN education at SAU through a seamless transition of credits. These graduates are required to have a current RN license prior to completion of the BSN completion program requirement (Undergraduate Catalog [SAU] 2013-2014).

The NCLEX-RN pass rate for the AS nursing graduates went down from 94.9% in 2010 to 88.8% in 2011, a drop of 6.1%. In 2012 the pass rate went up to 93.3%, but then dropped to 88.6% in 2013. Although the examination pass rate did not fall below the standard established by the governing bodies, I immediately decided to initiate this study. The most recent national pass rate for first-time, American-educated NCLEX-RN test takers dropped from 90.3% ($N = 150,266$) in 2012 to 83% ($N = 155,098$) in 2013—a drop of 7% (National Council of State Boards of Nursing, 2013g).

Although AS programs are the largest contributor to the RN workforce, a majority of the NCLEX-RN literature findings were related to baccalaureate nursing programs (Trofino, 2013). A majority of peer-reviewed NCLEX-RN studies within the past 10 years, such as Beeman and Waterhouse (2003); Frith, Sewel, and Clark (2008); Grossbach and Kunchel (2011); March and Ambrose (2010); McCarthy, Harris, and Tracz (2014); Lavandera et al. (2011); Seldomridge and DiBartolo (2004); Silvestri, Clark, and Moonie (2013); and, Uyehara, Magnussen, Itano, and Zhang, (2007) were designed for or generated from a baccalaureate nursing population. While these findings

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are helpful for certain aspects of nursing education, Trofino (2013) asserted that "the literature cannot be extrapolated to associate degree programs because baccalaureate programs are under different accreditation guidelines" (p. 5). The curricular foundation of BSN programs also require more courses in liberal arts, science, and concepts pertaining to leadership, community health, and research (Billings & Halstead, 2009).

The National League for Nursing's *Annual Survey of Schools of Nursing, Academic Year 2011-2012* revealed that the majority of the AS nursing students are over the age of 30 (Kaufman, 2013) and non-traditional. According to Bean and Metzner (as cited in Jeffreys, 1998), non-traditional college students are defined as undergraduates older than 24 years of age who may have more than just academic responsibilities (National Center for Education Statistics, 2002). Some college students must raise families and/or work full-time while in school.

By contrast, the majority of the population examined for this study consisted of traditional students who began college at age 18, immediately after graduating from high school (American Association of Colleges of Nursing, 2005). They did not meet the established age patterns or have the same level of responsibilities as students enrolled in most AS nursing programs. Some still lived at home, in the dormitories, or in university housing. In fact, some began their AS nursing education at age 17.

As one of the nursing faculty at SAU, I desire a fuller understanding of the students' characteristics that can potentially influence NCLEX-RN outcomes for its unique population of traditional and younger nursing students. I found no specific, current, peer-reviewed studies in the review of literature that correlate AS nursing

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program admission criteria among traditional-age college students, such as those at Southern Adventist University.

Purpose of the Study

The purpose of this study was to identify academic and non-academic factors (criteria) that may predict a successful NCLEX-RN outcome on first attempt among nursing graduates who completed the associate of science nursing program at Southern Adventist University. Unlike most associate degree nursing programs, a majority of the student population in this program began college immediately following completion of high school or a similar secondary educational equivalent. A greater understanding of the factors that impact NCLEX-RN outcomes in this population will assist nursing educators in developing effective plans for program admission, student progression, and a successful NCLEX-RN outcome on the student's first attempt. Successful NCLEX-RN outcomes among traditional students will not only add younger nurses to an increasingly older nursing workforce and help ease the anticipated RN shortage (e.g.: Buerhaus et al., 2006; Buerhaus et al., 2009; Health Resources and Services Administration, 2013), but it will also provide additional information to the body of literature on these complex issues.

Theoretical Framework

The theoretical frameworks underpinning this study are the Student Involvement theory (Astin, 1999) and the Input-Environment-Outcome (I-E-O) model (Astin, 1997). The Student Involvement theory, originally published in 1984, states that student involvement constitutes "the amount of physical and psychological energy that the

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student devotes to the academic experience" (Astin, 1999, p. 518). Astin (1999) bases his

theory on five assumptions:

> (1) involvement refers to the investment of physical and psychological energy in various objects. The objects may be highly generalized (the student experience) or highly specific (preparing for a chemistry examination); (2) regardless of its object, involvement occurs along a continuum; that is, different students manifest different degrees of involvement in a given object, and the same student manifests different degrees of involvement in different objects at different times; (3) involvement has both quantitative and qualitative features. The extent of a student's involvement in academic work, for instance, can be measured quantitatively (how many hours the student spends studying) and qualitatively (whether the student reviews and comprehends reading assignments or simply stares at the textbook and day dreams; (4) the amount of student learning and personal development associated with any educational program is directly proportional to the quality and quantity of student involvement in that program; (5) the effectiveness of any educational policy or practice is directly related to the capacity of that policy or practice to increase student involvement. (p. 519)

The object of involvement can be as specific as passing the NCLEX-RN. A

student who perceives learning as valuable is perhaps more engaged in the classroom,

more diligent, and more likely to pass the NCLEX-RN on his or her first attempt than a

student who is not. In addition, an academic environment with supportive policies and

practices can serve as a stage to encourage students' involvement (Astin 1999).

The Input-Environment-Outcome model is a measurement of academic growth or

success (Astin, 1997). This model is supported by three basic elements: (1) careful

examination of students' academic characteristics upon admission (input); (2) academic

practices or influential faculty and/or peers that students may come in contact with during

school hours (environment); (3) students' achievement of the desired outcome upon

graduation or completion of the education requirements (outcome). The extent of student

success is also influenced by academic environment factors such as academic policies,

faculty, and peer interactions. Of academic aspects, Astin (1997) identifies the peer group

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as "the single most potent influence on growth and development during the undergraduate years" (p. 398), followed next by faculty members. According to Astin (1997), excellent instruction; collaborative interaction on a teaching project; and student-professor interactions outside the classroom, which include being invited to a professor's home, contribute most to students' satisfaction, intellectual growth, and professional achievements.

In order for any particular curriculum to achieve its goals, "it must elicit sufficient student effort and investment of energy to bring about the desired learning and development" (Astin, 1999, p. 522). Nursing educators need to consider various pedagogical approaches, including student input characteristics and environment influences to achieve the desired outcome.
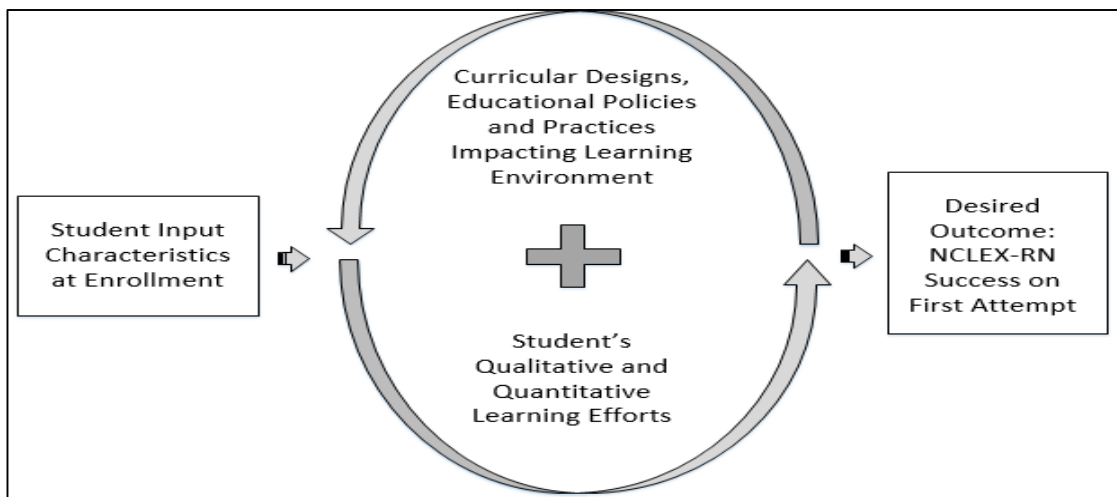
Figure 1. NCLEX-RN outcome framework.

The NCLEX-RN outcome framework (see Figure 1) is based on the Student Involvement theory (Astin, 1999) and the Input-Environment-Outcome (I-E-O) model (Astin, 1997). If the desired outcome is for students to pass NCLEX-RN on their first

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attempt, educators may infer that students with strong input characteristics at the time of college enrollment, such as higher GPA and ACT composite scores, may perform better than students with lower input scores. To engage students in the NCLEX-RN preparation, a nursing program may utilize commercial NCLEX-RN review courses, offer tutorial services, or require a standardized examination as part of its remediation guide. For example, a study by Morrison, Free, and Newman (2008) affirms that remediation activities (as part of environment factors) have a positive impact on NCLEX-RN outcomes among at-risk students. In this study, researchers discovered that the majority of nursing schools that have utilized the Health Education Systems, Incorporated (HESI) Exit Exam (E^2) have higher NCLEX-RN pass rates. Another study by Nibert, Young, and Britt (2008) also found that nursing students in schools that have integrated the HESI (E^2) scores as a program progression, graduation, and/or NCLEX candidacy requirement are better prepared to pass the exam.

Acceptable NCLEX-RN pass rates among first-time test takers is part of the accreditation requirements for nursing programs in the United States. The nursing curriculum must meet not only the workforce challenges, but also the standards set by the governing bodies (Iwasiw, Godlenberg, & Andrusyszyn, 2009). Approval of the program by the state board of nursing and other external accreditation organizations may require implementation of specific curriculum requirements (Billings & Halstead, 2009). The rules may vary from state to state. While the sole purpose of governing bodies is to ensure public protection, Billings and Halstead (2009) contend that the establishment of state regulatory control "may impact the creativity and flexibility that nursing faculty have within nursing programs, especially undergraduate curricula" (p. 120). While

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nursing programs may choose how to best implement the requirements, their resources and budget constraints may essentially dictate implementation approaches.

Nursing education, however, is a multifaceted process that demands more than just preparing students to pass the NCLEX-RN. Due to increasingly more complex healthcare requirements, nursing students must be able to demonstrate "multiple ways of thinking, such as clinical reasoning and clinical imagination as well as critical, creative, scientific, and formal criterial reasoning" (Benner, Sutphen, Leonard, & Day, 2010, p. 85) in order to provide safe and competent care. The effectiveness of curricular outcomes in nursing education can be determined by "core characteristics, or those qualities that faculty want graduates to display (Billings & Halstead, 2009, p. 146). Intellectual, social, and emotional interactions (Ambrose, Bridges, DiPietro, Lovett, & Norman, 2010) must be taken into consideration in the learning process. Astin (1999) emphasizes the importance of curricular designs and policies that focus on greater student involvement. New students coming straight from high school are young and, consequently, more subject to a wide range of external influences, especially from their peers. According to Astin (1997), "students tend to change their values, behavior, and academic plans in the direction of the dominant orientation or their peer group" (p. 363). Astin (1997) underscores the far-reaching impact of student-to-student interaction, particularly in the development of skills involving leadership, critical thinking, and problem solving. In the undergraduate nursing program at SAU, the peer factor is taken into consideration early. First-year students are required to enroll in a Southern Connections course that introduces them to topics of interest within their chosen area of study (Undergraduate Catalog [SAU], 2013-2014). In addition to seminars by nursing faculty on nursing history, critical

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thinking, time management, and note-taking skills, pre-nursing students are introduced to nursing mentors in this course. These mentors are junior or senior nursing students who receive a $500 stipend from the university to help freshmen transition from high school to college life. Peer influence is also integrated into preparation for the NCLEX-RN. In the last semester of the AS program, former SAU graduates who passed or failed the examination are invited to share their experiences with graduating student.

One mark of excellence in undergraduate education is the inclusion of pedagogical approaches that value supportive collaboration among faculty and students (Chickering & Gamson, 1987). Such collaboration includes counseling services and support for students who may be experiencing poor academic performance, test anxiety, or learning difficulties. SAU nursing faculty utilize the "Early Alert" system regularly to provide early intervention and professional counseling for students in a private and safe environment. Astin (1997) also finds that faculty-student interactions outside the classroom lead to higher academic attainments. This conclusion is validated by several other studies. Positive faculty and student relationships are invaluable in terms of program completion and NCLEX-RN success (Caputi & Englemann, 2008; Uyehara et al., 2007). Shelton (2003) finds that students are more likely to seek help from faculty who are supportive.

Southern Adventist University's nursing program offers a tutorial program, Assisting Students to Achieve Professionally (ASAP), taught by an experienced nursing professor emeritus. This program is designed to help students improve their study habits and to provide a review of key concepts, test-taking skills, and resources available for NCLEX-RN preparation. In addition to ASAP, the nursing faculty maintain an "open

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door" office policy and share their mobile phone numbers with each student. Since there is no "one" perfect pedagogical solution (environment) to enhance student preparation for the NCLEX-RN, a wide range of pedagogical approaches are integrated throughout the curriculum, especially in the last semester of the AS program.

According to Earle and Myrick (2009), millennials—in reference to students born between 1980 and 2000—are more comfortable with technology and collaborative teamwork, and they are driven by instantaneous feedback for their academic efforts. A study by Bye, Pushkar, and Conway (2007) concludes that traditional college students between the ages of 18 and 21 are also more likely to be driven by approval and external signs of worth. Consequently, nurse educators need to review each pedagogical approach based on its individual merits. Various pedagogical approaches, such as experiential learning using high-fidelity simulation, case studies, a flipped classroom, and a modified version of problem-based learning, are utilized in this nursing program to accommodate a variety of student learning styles. Studies confirm that students who are exposed to problem-based learning (PBL) teaching strategies display increases in critical thinking abilities (Lyons, 2008), knowledge acquisition, and clinical competencies (Williams & Day, 2009). Yet, PBL and subsequent improvement in critical thinking skills among students participating in this teaching approach did not correlate with success on the NCLEX-RN (Lyons, 2008). The limitations of the study by Lyons might have been due to a small sample size ($N = 54$) and the fact that this teaching methodology was employed for only one semester. In PBL settings, students do not have full details of the problem (Svinicki & McKeachie, 2011). Instead, PBL assumes that students must get involved in construction of their own knowledge. But the premise of minimal guidance may not

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necessarily lead to satisfactory learning outcomes. Students often perceive the problem-based-learning environment as lacking direction and marred by inconsistencies between facilitators and peer evaluators (Wells, Warelow, & Jackson, 2009). According to Wells et al., tension and resentment may occur when academically stronger students take over the learning process or when those who do not contribute to the learning process are still rewarded with good grades. While similar issues may occur in a traditional classroom, group size plays a significant role in a problem-based setting. PBL occurs best in small groups "of less than ten students" (Wells et al., p. 192). But sooner or later, most colleges or universities experience increased enrollment or budgetary constraints, forcing facilitators to accommodate more students by enlarging the group size, which essentially compromises the students' learning experiences (Wells et al.). However, Kirscher, Sweller, and Clark (2006) argue that "learners must construct a mental representation or schema irrespective of whether they are given complete or incomplete information. Complete information will result in a more accurate representation that is also more easily acquired" (p. 78). Most novice learners have neither an in-depth understanding of the intended learning context nor the experience needed to establish an adequate bank of long-term memory that would enable them to benefit from this approach. Therefore, Kirscher et al. (2006) conclude that giving incomplete or partial information does not increase the beginner student's ability to fully construct or to complete the intended learning task.

Astin (1999) asserts that most curricular approaches have limitations. Therefore, the Student Involvement theory and the Input-Environment-Outcome model can serve as a conceptual substitute. The theory and model not only allow room for inclusion and

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adaptation of various theories, but also hold educators and students accountable for their actions in the terms of learning achievements. Mastery requires repetition, practice of integration, and application of knowledge (Ambrose et al., 2010). This process does not occur overnight. Novice learners, in particular, need personal investment and supportive academic environment. According to Zull (2002), a teacher's ability to reach students at their emotional level provides the most conducive learning environment that will lead to long-term memory.

Students with less-than-perfect input characteristics may still have a chance at passing the NCLEX-RN with thoughtful remediation strategies and individualized preparation. Strategic planning of curriculum, admission, and progression policies can improve NCLEX-RN outcome. Academically weak students benefit from structured instruction more than academically strong students (Svinicki & McKeachie, 2011). For example, if a traditional PBL method does not work, a modification of the delivery approach may be necessary. Modification of a curriculum approach does not necessarily nullify the strengths of its original version. As the facilitator, a professor should have the authority to adapt and adjust his or her curriculum to best meet the students' learning outcomes—even if it may include more guided interaction than the original theory intended. Many studies have indicated that various academic factors (e.g., Beeman & Waterhouse, 2001; Seldomridge & DiBartolo, 2004; Silvestri et al., 2013) and non-academic factors (e.g., Eddy & Epeneter, 2002; Poorman & Webb, 2000; Silvestri, et al., 2013) can influence student performance on the NCLEX-RN.

Students and faculty may not always share similar goals and interests. However, "people are more motivated to engage in behaviors to attain goals that have a high

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relative value" (Ambrose et al., 2010, p. 74). Therefore, learning must be meaningful in order to engage students in activities (Astin, 1999) that will help them succeed academically and professionally. Nurse educators must consider all facets that will lead to mutual learning goals. Otherwise, any attempts to strengthen nursing education and to sustain a future nursing workforce will falter as new graduates continue to fail the NCLEX-RN.

Variables

The theoretical frameworks underpinning this study have guided the selection process of predictor variables. The academic variables were comprised of ACT college readiness assessment scores, admission cumulative GPA, grades in pre-requisite courses and core nursing courses, and HESI (E^2) Exit test scores. The number of days between NCLEX-RN delay was also included in this segment. The non-academic variables or demographic data were comprised of each student's gender, ethnicity, and age at the time of enrollment in NRSG 106 (Fundamentals I). The study also examined the potential impact of language background or ESL (English as a second language) background, successful completion of basic writing and English courses, and number of attempts to complete the required core nursing courses. See Table 1 for additional definitions of the academic and non-academic variables included in this study.

Definition of Terms

General or Operational Definitions

Definitions have been provided for the general and operational terminology used for this study, as shown in Table 1.

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Table 1

General or Operational Definitions

Traditional College Students	Operational terminology: Students who begin the nursing program or enroll in NRSG 106 (Fundamentals I) at age of 30 or younger.
Academic Variables	Operational terminology: Test scores or final grades for nursing and non-nursing courses as part of university or program requirements.
Pre-Nursing Admission Criteria	Operational terminology: Criteria that must be met before a student is considered for admission into the nursing program
	The pre-nursing admission criteria are as follows: a minimum overall GPA of 2.9, a minimum score of 20 in reading on ACT, a minimum score of 18 in English on ACT or successful completion of ENG 101 (College Composition I), a minimum score of 16 in math on ACT or a successful completion of a math course, and a minimum score of 550 on TOEFL (Test of English as a Foreign Language) for students whose native language is not English.
Pre-requisite Courses	Operational terminology: Non-nursing courses that must be completed prior to admission or completion of the nursing program.
	A minimum grade of C is required for the following pre-requisite courses: BIOL 101 (Anatomy and Physiology I), BIOL 102 (Anatomy and Physiology II), CHEM 111 (Survey of Chemistry I), NRNT 125 (Nutrition), PSYC 128 (Developmental Psychology), and BIOL 225 (Basic Microbiology).
Nursing Program Criteria	Operational terminology: Criteria that must be met in order to progress through or graduate from the nursing program.
	A minimum grade of C+ is required for each of the following nursing courses: NRSG 106 (Fundamentals I), NRSG 107 (Fundamentals II),

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Table 1 (continued)

General or Operational Definitions

Nursing Program Criteria (continued)	NRSG 126 (Adult Health I), NRSG 130 (Mental Health), NRSG 212 (Childbearing Family), NRSG 226 (Adult Health II), NRSG 231 (Child Health), and NRSG 305 (Adult Health III).
	A minimum cumulative nursing GPA of 2.3 and successful completion of HESI Exit Exam (E^2) (or subsequent HESI (E^2) remediation) and NCLEX-RN delay are a part of nursing program criteria.
Non-Academic Variables	Operational terminology: Variables or factors that do not relate to a student's academic responsibilities. The non-academic variables used in this study are ethnicity, gender, and age at the time of enrollment in NRSG 106 (Fundamentals I).
ESL or Language Background	General terminology: Students who do not speak English as their primary language at home and/or are required to pass the Test of English as a Foreign Language (TOEFL) to meet the university admission criteria. Operational terminology: Students who are required to take English Language Skills, TOEFL, or basic writing courses prior to College Composition I (ENG 101) and College Composition II (ENG 102). This includes students who took a basic writing course and/or speak English as a primary language at home but do not achieve a minimum score of 18 in English on ACT.
Number of Attempts to Complete Core Nursing Course	Operational terminology: The number of times a student attempts to pass a required core course in order to achieve the minimum acceptable grade. A course that is being repeated is considered a course failure. The number of core nursing courses from enrollment to graduation in this study is eight. The number of attempts to complete core nursing courses may vary.

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Table 1 (continued)

General or Operational Definitions

Time Lag to Testing or NCLEX-RN Delay	General terminology: "The number of days between eligibility date and the actual [NCLEX-RN] test date" (Woo, Wendt, & Liu, 2009, p. 23). Operational terminology: The number of days between commencement (completion of AS program requirement) and actual test date or documented NCLEX-RN test results.

Research Questions

The following research questions used for this study were based on academic and non-academic secondary data of students who completed the AS nursing program at Southern Adventist University:

1. Do non-academic variables contribute to successful NCLEX-RN outcomes?

2. Which pre-nursing admission variables contribute to successful NCLEX-RN outcomes?

3. Which nursing program variables contribute to successful NCLEX-RN outcomes?

4. Which set of variables, from all models generated, contribute to successful NCLEX-RN outcomes?

Significance of the Study

An associate of Science (AS) in nursing degree is the educational foundation for a majority of the registered nurses in the United States, but there is a paucity of literature that investigates correlations between AS programs and NCLEX-RN outcomes (Trofino, 2013). This insufficiency in the literature is especially apparent for studies that

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investigate NCLEX-RN outcomes among the younger, traditional college student population enrolled in AS programs. This study adds to the body of literature in the areas of NCLEX-RN predictors among traditional student populations graduating from AS programs. The information collected also contributes to the body of literature in the area of a predicted nursing shortage. Nursing programs can strengthen their policies and procedures by identifying the specific factors that contribute to NCLEX-RN success in this population, and that, in turn, will help add younger nurses to the increasingly older RN workforce (Buerhaus et al., 2006; Health Resources and Services Administration, 2013).

Delimitations of the Study

This study was delimited to students who were accepted into the AS program at Southern Adventist University during consecutive fall-to-winter or winter-to-fall semesters, completing the program between the winter 2006 and winter 2014 semesters. This time frame provided data on the pass rates of students who took the NCLEX-RN over three cycles of changes in passing standards, which occurred in April 2007, April 2010, and April 2013. Four minor changes in curricular, admission, or progression policies took place in the program during this time frame. (1) Starting in the fall 2007 semester, ACT became the only standardized examination accepted for admission into the nursing program. Prior to this time, students who took the SAT were required to take the Nelson-Denny reading test to substitute for the ACT reading component. (2) Since Survey of Chemistry I (CHEM 111) or a similar course is a pre-requisite in most BSN programs (and is a required part of the AS nursing program at Southern Adventist University), high school chemistry was removed from admission criteria beginning in the

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fall 2010 semester. (3) In order to accommodate constituent demand, enrollment in Fundamentals I (NRSG 106) increased by approximately 10 to 15 students beginning in the winter 2010 semester. (4) The minimum score required on the HESI Exit Exam (E^2) increased from 850 to 900 at the beginning of the fall 2013 semester.

Students records were evaluated to ensure that they met the following inclusion criteria: students were no older than 30 years of age when they enrolled in the NRSG 106 (Fundamentals I) course and had a recorded NCLEX-RN result (pass or fail). Excluded from the study were students who were accepted into the nursing program through the university's Summer Study Option (SSO); held a professional nursing license, such as Licensed Practical or Vocational Nursing; and/or did not complete introductory-level core nursing courses (NRSG 106 or NRSG 107) at SAU. The purpose of the SSO was to accommodate students who met the program's admission requirements but were put on a wait list due to limited classroom and/or clinical space. The majority of students who applied for and enrolled in the SSO program were older and non-traditional. Some were married and had finished a college degree prior to pursuing the pre-licensure (RN) degree. Similarly, nursing students who held LPN or LVN licenses were older, had substantive healthcare-related work experience, and did not fall under the traditional college student definition.

General Methodology

The purpose of this study was to identify academic and non-academic variables that may predict a successful NCLEX-RN outcome on first attempt among nursing graduates who completed the AS nursing program at Southern Adventist University. Logistic regression analysis was used to investigate a correlation between independent

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and dependent variables. Additional exploratory data analysis, utilizing Chi-square test for association between NCLEX-RN outcomes (pass or fail) and selected independent variables, was also performed. Chapter 3 will present additional information regarding the methodology used for this study.

Organization of the Study

Chapter I is comprised of several segments. It begins with an introduction of the study, followed by descriptions of the problem statement, theoretical foundation, variables, definition of terms, research questions, significance of the study, delimitations, and general methodology approach. Chapter II focuses on a review of the literature pertaining to this study. Chapter III is an elaboration of the research methodology utilized in the study. Chapter IV outlines the findings, and Chapter V presents the conclusion of the study as well as recommendations for further research.

CHAPTER II

LITERATURE REVIEW

Introduction

Approximately 26,000 American-educated nursing graduates who took the

NCLEX-RN for the first time failed in 2013—a 7% increase in failure rate than in 2012

(National Council of State Boards of Nursing, 2013g). According to Astin (1997, 1999),

multiple factors within the academic environment contribute to students' academic

success. The review of literature revealed a plethora of studies of various factors that

influence NCLEX-RN outcomes among first-time test takers. Unfortunately, NCLEX-RN

outcomes continue to stir controversy. This chapter provides an empirical review of the

literature relevant to current study, including delimitation of the Literature Review, the

NCLEX-RN process, academic and non-academic variables that contribute to NCLEX-

RN outcomes in pre-licensure programs, NCLEX-RN pass rates, consequences of

NCLEX-RN failure, and a summary.

Delimitation of the Literature Review

Because the students' performance on NCLEX-RN is an area of continuing

concern in pre-licensure nursing programs across the country, it requires the most recent

and logical literature supports. The literature search was delimited to peer-reviewed

articles published in the past 15 years that have undergone additional content analysis by

experts before they were accepted for publication in U.S.-based journals. My strategy for

delimiting literature searches was to yield the latest themes and discrepancies that may

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exist in relation to NCLEX-RN predictors in pre-licensure nursing programs in the United States.

Relevant keyword searches were conducted using electronic databases at Southern Adventist University, such as CINAHL Complete, Health Reference Center-Academic, MEDLINE, Ovid Nursing, and the Internet. Keywords or general terms and combinations of both, such as NCLEX-RN, NCLEX-RN predictors, NCLEX-RN performance, NCLEX-RN variables, NCLEX-RN and/or academic predictors, NCLEX-RN and/or non-academic predictors, NCLEX-RN and/or pre-licensure programs, NCLEX-RN demographics, NCLEX-RN success, or NCLEX-RN failure were included. Abstracts of articles generated from the electronic databases were further evaluated in order to obtain succinct ideas. A review of the reference sections in several key articles yielded additional relevant themes for current study. In addition, interlibrary loan service provided access to journal articles that were not available from McKee Library at Southern Adventist University.

NCLEX-RN Process

According to the 2013 *NCLEX-RN® Examination Test Plan for the National Council Licensure Examination for Registered Nurses* (National Council of State Boards of Nursing, 2013e), NCLEX-RN test items are developed to assess the knowledge, skills, and abilities of nursing graduates to ensure that they are trained to practice safe entry-level nursing care. Each item is written and vetted by a panel of nursing experts before it becomes operational (National Council of State Boards of Nursing, 2013e). The delivery method of the NCLEX-RN has evolved from a paper-and-pencil format to a computerized-adaptive testing (CAT) system that has the capability to individualize the

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examination according to each candidate's response to a previous test question (National Council of State Boards of Nursing, 2013b). The National Council of State Boards of Nursing (2013b) states that a candidate will pass the test if the CAT has determined with 95% confidence that the examination taker has performed consistently above the passing standard. Therefore, a candidate may take a minimum 75 or up to 265 test items and can pass or fail at any given test item, depending on his or her performance. The candidate may also fail if he or she has not met the minimum competency level or has not answered the minimum required number of test questions within the six-hour maximum test time limit (National Council of State Boards of Nursing, 2013b, 2013f).

While proponents believe the nature of high-stakes examinations such as the NCLEX-RN hold students and educators accountable to a standard of excellence, critics say it often negatively impacts the learning process. For example, critics blame such testing for creating nursing programs that are subjected to a non-flexible curriculum and excessive test preparation (Blazer, 2011). Critics also argue that low-performing, low-income, and minority students are particularly disadvantaged as result of this test approach (Blazer). Therefore, according to the American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education (1999), authorities responsible for setting examination standards must take additional precautions to ensure that high-stakes examinations such as the NCLEX-RN provide a true evaluation of students' abilities. In addition, they discourage reliance upon one examination result as a sole measurement of achievement.

In an attempt to ensure the validity and reliability of its passing standard, the NCLEX-RN is subject to strict examination development guidelines (Woo & Dragan,

2012). Because views and opinions on the passing standard may vary from person to person, the process of achieving a consensus when setting that standard is crucial for establishing the test's validity and reliability (O'Neill, Marks, & Reynolds, 2005). The National Council of State Boards of Nursing (NCSBN) board of directors, which comprises elected personnel from all of the state, commonwealth, or territorial boards of nursing (National Council of State Boards of Nursing, 2013e), is therefore responsible for reviewing, revising, and making the final decision regarding the examination passing standard every three years (National Council of State Boards of Nursing, 2013e; O'Neill, Marks, & Reynolds, 2005; Wendt & Kenny, 2007). Since the NCLEX-RN examines entry-level practice, additional steps are taken to ensure that both the operational test questions and the passing standards reflect the reasonable competency of new nursing graduates. Practice analysis specific to current practice of registered nurses within six months of graduation is compiled from various sources, including newly licensed registered nurses, nurse educators, and employers (O'Neill, Marks, & Reynolds; Wendt & Kenny). NCLEX-RN candidates should be able to select a response or responses to a test item based upon their nursing knowledge. Each test question goes through language and readability analyses, as part of the differential-item analysis to reduce influences of "extraneous constructs, such as gender and ethnicity" (Woo & Dragan, p. 31) as well as other related non-academic factors.

Academic and Non-Academic Variables

Researchers commonly utilize various academic and non-academic criteria to predict NCLEX-RN outcomes. Evaluation of student performance using academic criteria, in particular, is a standard practice to measure academic potential and growth

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(Astin 1997, 1999). This selection process operates under the premise that high-performance students—those with higher tests scores or grades—perform better in nursing school and ultimately pass the NCLEX-RN. In general, academic criteria incorporate test scores or grades to evaluate student performance before and after acceptance into a nursing program. Scores on standardized college pre-admission tests such as the ACT or SAT (e.g., Grossbach & Kunchel, 2011), Test of Essential Academic Skills (TEAS) (e.g., McCarthy et al., 2014), or Nurse Entrance Test (NET) (e.g., Tipton et al., 2008) were included in many studies. Grades in pre-requisite courses (e.g., Higgins, 2005), grades in nursing courses (e.g., Beeman & Waterhouse, 2001), nursing GPA (e.g., Gilmore, 2008), and NCLEX-RN predictor exams (e.g., Morrison, Adamson, Nibert, & Hsia, 2004) were also under scrutiny in many NCLEX-RN studies. However, the influence of non-academic factors cannot be ignored. As pointed out by Astin (1993, 1999), achievement of the desired outcome can be influenced by the extent of a student's involvement academically and the extent of other or unknown variables (Beeson & Kissling, 2001. Non-academic variables such as emotional factors (e.g., Arathuzik & Aber, 1998), self-efficacy (e.g., Silvestri et al., 2013), and NCLEX-RN delay (Woo et al., 2009) were also evaluated in NCLEX-RN studies.

Beeman and Waterhouse (2001) utilized the discriminant analysis test to predict NCLEX-RN success. Secondary data of 289 students from a baccalaureate nursing program were collected between 1995 and 1998. The non-academic variables collected were gender, age at graduation, type of nursing program, and year of graduation. The academic variables included in this study were SAT verbal and math scores, grades for Biology courses, grades for Physiology and Pathophysiology courses, grades for nursing

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courses, grades in clinical courses, and GPA. The study was able to correctly classify students who passed the NCLEX-RN with 94% accuracy, and it could classify with 92% accuracy those who failed the examination. Of the variables chosen in this study, a grade of C+ or lower earned in a didactic nursing course was reported as the most significant predictor of the NCLEX-RN failure. Grades in Restorative Nursing Interventions I and II, Introductory Nursing, and Pathophysiology were also statistically significant in predicting the NCLEX-RN result. Age, gender, and SAT verbal score were not predictive of NCLEX-RN success or failure. The authors concluded that secondary data can be used to accurately anticipate NCLEX-RN outcome, to identify students at risk for failing the NCLEX-RN, and to plan for early intervention.

Beeman and Waterhouse in 2003 conducted a follow-up study focusing on post-graduation factors that influence a successful NCLEX-RN outcome. In this study the NCLEX Preparation Survey (NPS) was mailed to 30 students after graduation. The survey collected a total of 62 factors; selected variables in the report included age, gender, marital status, NCLEX-RN results, number of weeks between graduation and taking the NCLEX-RN, major life events between graduation and taking the NCLEX-RN, continuing stress between graduation and taking the NCLEX-RN, enrollment in new nursing-related classes between graduation and taking the NCLEX-RN, number of hours worked per week between graduation and taking the NCLEX-RN, total number of hours studied between graduation and taking the NCLEX-RN, average number of hours of daily sleep between graduation and taking the NCLEX-RN, number of hours studied in the week prior to taking the NCLEX-RN, and number of hours worked in the week prior to taking NCLEX-RN. Twelve students responded to the survey. Most of the participants

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were single females with a mean age of 28.7 and the majority had no children at home. The authors reported a pass rate of 83% since two of the participants in this study failed the licensure examination on first attempt. The NCLEX-RN delay in this population was more than nine weeks (270 days).

Using the Spearman-Rank-Order Correlation, the study found that the total number of hours a candidate studied prior to taking the examination correlated with NCLEX-RN success ($rho = .648$, $p \leq .022$), and the number of hours the individual studied the week prior to taking the examination also proved significant ($rho = .585$, $p \leq .045$). The total number of study hours between graduation and taking the examination ranged from 14 to 154 hours in this group ($M = 66$), and the number of hours spent preparing for the NCLEX-RN the week prior to the examination ranged from 0 to 32 hours ($M = 11.8$) of candidates who passed. Candidates who failed the examination reported the least amount of study time (between 14 and 26 hours) between graduation and the test date; they also focused more on orientation at a new nursing job than on preparation for the licensure examination. No other variables (including demographic data, amount of exercise, amount of sleep, experiencing major life events, experiencing ongoing stress, the number of weeks in the NCLEX-RN delay period, the number of hours worked, or having taken a review course) correlated with NCLEX-RN success in this small study population.

In another study, Beeson and Kissling (2001) utilized a stepwise logistic regression model to predict successful NCLEX-RN outcome from a data sample of 505 BSN students. This study collected a combination of academic and non-academic (age and gender) variables. The academic data were composed of each student's Mosby

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Assess Test score, GPA and grades in pre-requisite courses, and GPA and grades in nursing courses. The students' GPA and grades were calculated at the sophomore, junior, and senior nursing levels and for all nursing classes. The Mosby Assess Test was administered to students during their senior year as part of an NCLEX-RN assessment of readiness. Students who did better on the NCLEX-RN had a higher mean score on the Mosby Assess Test (M = 222.7) than those who failed (M =184.6). Additional results indicated that the number of times a nursing student earned a grade of C, D, or F through the junior level correlated highly with a poor NCLEX-RN outcome in this population (p < .001). Higher-performing students—those without any C grades—had a passing rate of 97%. The pass rate dropped to 84% for students who had at least one grade of C or below in nursing courses, and it dropped to 51% for students who had three or more grades of C or below in nursing courses taken before the senior year. Although no specific descriptions of nursing courses were provided in this study, students who earned C grades during the sophomore year continued to earn more Cs in the junior year, which could impact their outcome on the NCLEX-RN. The study found that students who passed the NCLEX-RN on first attempt had a higher GPA in all cognate courses (M = 3.37, SD = .50), a higher GPA in all nursing courses (M = 3.44, SD = .37), and a higher score on the Mosby Assess Test (M = 222.7, SD = 36.8) than did students who failed the examination on first attempt. The mean age of this sample was approximately 26 years of age when the candidate took the NCLEX-RN. Age was the only factor in this study that was predictive of NCLEX-RN outcome, and older students outperformed younger ones on the examination. Beeson and Kissling concluded that NCLEX-RN results may be influenced

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by unknown factors; therefore, they advised nurse educators to continue seeking variables that predict success for their own population.

McGahee, Gramling, and Reid (2010) utilized a logistic regression approach to evaluate factors that influenced a passing score on the NCLEX-RN for a small sample of 153 BSN graduates from one university. This study included no non-academic data. The initial model included the following variables: SAT or ACT score, all standardized test scores, science GPA prior to nursing admission, critical thinking test score, writing portfolio score, all nursing grades, the number of nursing course failures, graduating GPA, and the total number of semesters needed to complete the nursing program. After initiation of the backward elimination and stepwise regression, the study was left with the following six student variables: science GPA, RN assessment test scores, and grades in Fundamentals of Nursing, Health Assessment, Theoretical Foundation, and Pathophysiology. Of these six variables, the authors found that the RN assessment test score ($p = .03$) and a grade of C or higher in the Theoretical Foundation course ($p = .001$) were significant; in addition, a passing grade in the Pathophysiology course ($p = .056$) was a marginally significant predictor of NCLEX-RN outcome. The researchers drew two additional conclusions from this study. First, utilizing a combination of selected variables improved the predictive power of the variables. In this study, a combination of a student's science GPA, RN assessment test score, and grade in the Health Assessment course produced a strong three-way interaction ($p = .006$). Second, the researchers discovered a significant two-way interaction between a student's science GPA and his or her grade in Fundamentals of Nursing ($p = .002$); between the science GPA and the grade earned in Pathophysiology ($p = .02$); and also between the science GPA and the grade

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earned in Health Assessment ($p = .04$). Of 146 students who were predicted to pass the NCLEX-RN, only 131 actually passed the exam. Of six students who were predicted to fail, only one actually failed the examination.

Several other studies involving BSN programs (e.g., Seldomridge & Dibartolo, 2004; Silvestri et al., 2013) and nursing programs for students who had earned a prior college degree (Penprase, Harris, & Qu, 2013) affirmed that grades in various core nursing courses, particularly courses related to Medical-Surgical nursing, were strong predictors of NCLEX-RN outcome. The *Report of Findings from the 2011 RN Nursing Knowledge Survey* (National Council of State Boards of Nursing, 2012) found that a majority of newly licensed RNs were employed in a hospital setting, caring for adults between the ages of 18 to 85 years who had acute and chronic conditions. In addition, medical-surgical nursing ($n = 216$, 38%) and critical care nursing ($n = 132$, 23%) were listed as the top two employment specialties by newly licensed RN respondents in 2011 (National Council of State Boards of Nursing, 2012). Because the NCLEX-RN is designed to assess entry-level practitioners, most of whom find work in a setting that emphasizes adult care, then it makes sense to anticipate a higher correlation between a candidate's grades in Medical-Surgical nursing courses and his or her success on the NCLEX-RN.

Grades in science courses, Psychology, or other pre-requisite courses are an important component of the nursing admission process. The purpose of these courses is to develop each student's understanding of the human body as well as the caring principles associated with nursing. The required courses may vary according to each type of pre-licensure program. Chemistry, Anatomy and Physiology, Human Growth and

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Development, Nutrition, and Microbiology are examples of specific pre-requisite courses in most AS programs. BSN programs may include additional support courses, such as Statistics and Pathophysiology, as part of their pre-requisite course plan (e.g., Seldomridge & DiBartolo, 2004).

Using a logistic regression approach, Trofino (2013) evaluated correlation between selected variables and successful NCLEX-RN examination results from another small sample ($N = 85$) of students in one AS nursing program. The selected variables were based on pre-admission criteria (age, gender, and transfer status); admission criteria (ACT, SAT, Test of Essential Academic Skills (TEAS) scores, and high school GPA); grades in science courses (Anatomy and Physiology I and II, Psychology, Human Growth and Development, and Microbiology); repetition of any supporting (prerequisite) courses; and grades in seven didactic nursing courses (Nursing Fundamentals, Pharmacology, Maternal Child, Medical-Surgical, Psychiatric, Leadership, and Advanced Medical-Surgical Nursing), including repetition of any of these courses.

This study concluded non-significant finding in all standardized pre-admission exams (ACT, SAT, and TEAS) except normalized math sub-score ($p = .03$). Although the mean high school GPA in this population was 3.19 ($SD = 0.53$), there was no significant correlation between GPA and NCLEX-RN outcome. The study also did not find a significant correlation between grades in the pre-requisite courses and NCLEX-RN scores. Of the seven nursing courses included in this study, only grades in Pharmacology ($p = .001$, $OR = 11$) and Advanced Medical-Surgical Nursing ($p = .03$, $OR = 6$) were significant indicators of the probability of passing the NCLEX-RN. The frequency of course repetition in pre-requisite or science courses (Anatomy and Physiology I and II,

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Human Growth and Development, Psychology, and Microbiology) did not prove an indicator of NCLEX-RN outcome. However, the study found that a student who never repeated a core nursing course was almost four times more likely to pass the licensure exam. Of the three demographic data collected (age, gender, and transfer status), the study found age to have the only marginally significant correlation with a candidate's results on the NCLEX-RN. In this study, the mean age was 24.79 years, and graduates older than 22 years were three times more likely to pass the examination than those who were younger.

Yin and Burger (2003) included data on 325 students from a Midwestern AS nursing program in order to evaluate the relationship between selected demographic data and academic variables and NCLEX-RN results. This retrospective correlational study included age at admission, gender, ethnicity, type of student (freshman or non-freshman admission, LPN or non-LPN status, transfer status, and previous degree), high school cumulative GPA, high school class rank, ACT composite score, number of college credit hours earned prior to program admission, college GPA, science GPA, GPA at college graduation, and grades in pre-requisite non-nursing courses (English, Introductory Psychology, Anatomy and Physiology, Chemistry, and Microbiology).

The study utilized *t*-tests and chi-square tests to compare means and other characteristics between the group that passed the NCLEX-RN ($n = 285$) and the group that failed the examination ($n = 40$) on first attempt. Of the selected variables, high school class rank, college GPA prior to nursing admission, grade in a college Introductory Psychology course ($M = 3.11$), and GPA for college natural science courses (Introductory Psychology, Anatomy and Physiology, Chemistry, and Microbiology) ($M =$

3.11) were significant. Students who were admitted with a college mean GPA of 3.20 did better on the NCLEX-RN than those who failed (*M* = 2.99). The study concluded pre-nursing admission GPA as the most important predictor of the probability of NCLEX-RN success. Demographic data (age, ethnicity, and gender), ACT composite score, grades in English courses, and other variables did not correlate with NCLEX-RN outcome (Yin & Burger, 2003). Researchers were perplexed by the absence of a positive correlation between grades in English reading or writing and a candidate's success on the NCLEX-RN. Discrepancies could be explained by the fact that language skills are not a primary focus of the curriculum for AS nursing students who formed this study population. Since NCLEX-RN testing utilizes mainly multiple-choice questions, "English composition in itself is not an inherent factor in NCLEX-RN testing" (Yin & Burger, p. 235).

Seldomridge and DiBartolo (2004) sought to predict NCLEX-RN results using data for 186 BSN graduates. Researchers collected a total of 13 predictors and then divided them into three sets of variables: (1) pre-admission variables (pre-nursing cumulative GPA; grades in Anatomy and Physiology 1, Pathophysiology, Chemistry, and Statistics), (2) nursing program variables using student data compiled through completion of the junior year (cumulative GPA after completion of the first semester of junior nursing courses, number of Cs earned in junior nursing courses, test averages in two Medical-Surgical didactic nursing courses), and (3) senior-year variables using data compiled prior to graduation (number of Cs in all nursing courses, percentile score on the National League for Nursing Comprehensive Achievement Test for Baccalaureate Students [NLNCATBS]).

Researchers used stepwise logistic regression and *t*-tests to predict the NCLEX-RN outcome. Of 13 student variables tested, the study found that the grade in Pathophysiology, the test averages in two Medical-Surgical didactic nursing courses, and the score on the NLNCATBS were significant and accurate in predicting NCLEX-RN success but not failure. The accuracy of predicting success based on these variables was 100%, 98.7%, and 94.7% respectively, and the accuracy of predicting failure based on these variables was 2.8%, 5.6%, and 25% respectively. By combining the student score on the NLNCATBS with the grade in Pathophysiology, the study was capable of predicting NCLEX-RN failure with an accuracy of only 50%. Thus, prediction of failure proved to be a challenge in this study. However, Seldomridge and DiBartolo (2004) argued that such a practice might frighten students and could lead to unintended learning consequences, such as self-fulfilling prophecy. The researchers further asserted that NCLEX-RN scores are complicated by periodic changes in testing standards, unknown or unidentified variables, non-academic factors, and diversity in population sample. Factors such as emotional status, family or work responsibility, readiness to take the exam, experience with computerized examination, NCLEX-RN delay, language background, age, or language background could influence student outcome (Seldomridge & DiBartolo).

A study by Higgins (2005) sought to identify factors that lower attrition and increase NCLEX-RN pass rates. The study was conducted in three phases, involving a sample of 213 students enrolled in a community college that had experienced a drop in its NCLEX-RN pass rate. Phase I of the study used a correlation coefficient to explore relationship between various variables and two possible outcomes (successful nursing

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program completion and successful NCLEX-RN outcome). Variables collected in this study were the students' scores on various standardized pre-admission tests, grades in pre-requisite courses (e.g., English, Chemistry, Psychology, Anatomy and Physiology, and Biology), and the score on the HESI Exit Exam. Of all of the pre-requisite variables collected, the results indicated that grades in Anatomy and Physiology II ($r = .152$) and Microbiology ($r = .191$) were significant in program completion, and a student's grade in Anatomy and Physiology I ($r = .171$) was also a significant of NCLEX-RN outcome. Of the standardized pre-admission tests, scores in reading ($r = .124$), science ($r = .184$), and math ($r = .129$) were significant in program completion. The science test score ($r = .518$) was a significant indicator of NCLEX-RN outcome, as was the HESI (E^2) score ($r = .191$) and the grade earned in the nursing skills course ($r = .281$).

In phase II of the study, Higgins (2005) interviewed 45 nursing program directors in Texas to find strategies that would help lower attrition rates and increase NCLEX-RN pass rates. Suggestions for improving student retention centered on four major themes: (1) adjustments to pre-admission requirements, which included use of pre-admission tests, a higher pre-admission GPA requirement, and limited enrollment; (2) utilization of an on-campus counselor; (3) implementation of a remediation process after nursing examination failure(s), which included strategies such as study sessions with faculty, test reviews, personal tutoring, and practicing test-taking skills; and (4) faculty involvement, which related mainly to the remediation process. The study also identified strategies for improving the NCLEX-RN pass rate, which focused on three major themes: (1) utilization of the HESI (E^2) as an NCLEX-RN predictor exam, which was mentioned by more than 75% ($n = 25$) of the 33 participating schools, (2) utilization of achievement

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tests to identify students at risk for NCLEX-RN failure and to implement a remediation plan throughout the curriculum, and (3) assessment and revision of test items to reflect NCLEX-RN style.

Ten faculty and 30 students were included in phase III of the study. Some similarities in themes were noted between the nursing program directors (phase II) and faculty. In terms of lowering attrition rates, two common themes emerged: (1) careful evaluation of the admission criteria and (2) mentoring, which involved other students, faculty members, or tutors. Faculty load and poor supervision of novice faculty appeared to be top concerns, because they influence a teacher's ability to facilitate learning and implement new teaching strategies. In terms of improving NCLEX-RN success, the theme that emerged among all participants (including students) was revising test items to reflect NCLEX-RN style. The theme most often mentioned by faculty was implementing teaching strategies that involve critical thinking, active learning, and application of knowledge. In addition, faculty also suggested adding more Medical-Surgical and Pharmacology content to the curriculum in order to increase exam pass rates. According to Higgins (2005), students seemed confounded when asked how to improve attrition rates. By contrast, they were more astute at naming strategies to improve preparation for the NCLEX-RN. The majority of the students suggested expansion of learning content to include topics such as pharmacology, assessment, ventilator, infection control, prioritization, and delegation. Another common theme that emerged among students was utilization of a review book to prepare for the NCLEX-RN. They mentioned Kaplan, in particular, as a source with questions that reflect NCLEX-RN style. Despite recommendations, the study did not elaborate whether or not recommendations from

phase II and phase III were implemented at the researcher's institution. The study also provided no details of attrition rates or NCLEX-RN pass rates of nursing programs that participated in phase II.

In a retrospective predictive study, Penprase et al. (2013) investigated the correlation of various academic factors and NCLEX-RN success in a group of adult learners ($N = 363$) from an Accelerated Second Degree Nursing (ASDN) program. The mean age of the sample was 33 years, and participants were predominantly Caucasian female students. This study population is comparable with most non-traditional AS nursing student populations in the United States (Kaufman, 2013). The predictor variables in this study comprised a Test of Essential Academic Skills (TEAS) score taken within a month of nursing program enrollment, Assessment Technologies Institute (ATI) NCLEX-RN Predictor examination, as well as grades earned in all eight pre-requisite courses and 22 nursing courses. The result indicated that a student's grade in Comprehensive Adult Nursing I was a significant indicator of NCLEX-RN outcome, followed by the grade earned in Pathophysiology and cumulative GPA. For every 0.1 increase in a student's GPA (scale of 0-4), the probability of the student passing the examination increased by 59%, 24%, and 23% respectively. The ATI NCLEX-RN Predictor examination score was also associated with NCLEX-RN success, with a probability of 20% for every 1% increase in test score. This study underscored two important points: (1) Since students enrolled in Comprehensive Adult Nursing I early in the nursing program, their performance in this course could be utilized to identify students at risk for failing the NCLEX-RN. (2) The Pathophysiology course, as a pre-

requisite course prior to nursing enrollment, could help students make better clinical judgments.

Discrepancy between various academic variables, including pre-requisite science courses and NCLEX-RN results, were found in several studies. A study by Seldomridge and DiBartolo (2004) did not find significant correlation between NCLEX-RN outcome and the grade earned in Chemistry, Anatomy and Physiology, or Statistics courses. By contrast, Higgins (2005) found strong correlation between the NCLEX-RN pass rate among 213 nursing students in a community college and their grade in Anatomy and Physiology I ($r = .0171$). In addition to Anatomy and Physiology, Yin and Burger (2003) found the student's grades in the Introductory Psychology, Chemistry, and Microbiology to be variables that correlated positively to a passing score on the NCLEX-RN. Several studies cited a student's grade in Pathophysiology as a strong predictor of NCLEX-RN outcome (Beeman & Waterhouse, 2001; Landry, Davis, Alameida, Prive, & Renwanz-Boyle, 2010; Penprase et al., 2013; Seldomridge & DiBartolo, 2004), whereas Uyehara et al. (2007) argued that a student's grade in Pathophysiology was a strong predictor of his or her withdrawal from the BSN program ($N = 271$, $p < .0001$), not success on the NCLEX-RN. The data demonstrated that the probability of a student failing the nursing program was 31% for those who earned a C grade in Pathophysiology, 57% for those who earned a D grade, and 80% for those who earned an F grade. Almost half of the students who earned a grade of C or below in Pathophysiology in this study withdrew from the nursing program.

In a retrospective study, Gilmore (2008) explored correlation between pre-admission criteria to predict success measured in students' nursing GPA and NCLEX-RN

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result. Gilmore collected a total of seven predictor variables for this study. The variables were composed of cumulative GPA prior to admission into the nursing program, ACT scores (the composite score as well as individual subset scores in reading, English, and science), and grades in Anatomy and Physiology I and Anatomy and Physiology II courses. The study formed its population ($N = 218$) using a convenience sample from two AS nursing programs at two community colleges. The population was then divided into two groups based on students' success in their nursing program. Students who were successful in completing their nursing program ($N = 176$) were further divided into two subgroups based on NCLEX-RN outcome: those who passed the examination ($n = 161$) and those who failed it ($n = 14$).

The study indicated that students who successfully completed the nursing programs had higher ACT composite, reading, and English scores or higher grades in Anatomy and Physiology courses. Logistic regression analysis of the independent variables indicated that the ACT English score was significant in predicting program completion ($p = .022$). Gilmore asserted that "all of the independent variables in totality were predictors of NCLEX-RN success, and only the variable nursing GPA was statistically significant in predicting NCLEX-RN success" (p.123).

In conclusion, Gilmore argued that a student's proficiency in language and reading comprehension, as shown in this study by the predictive ability of the ACT English and ACT reading scores, was critical for development of critical-thinking skills and nursing competency, both of which are vital for successful performance in a nursing program and on the NCLEX-RN. However, there were inconsistencies in the literature regarding the correlation of English grades and/or scores on standardized exams that

focused on English reading or English comprehension (Higgins, 2005; Yin & Burger, 2003).

Comprehension of the English language has been considered a vital component in a student's completion of a nursing program and success on the NCLEX-RN (Bosher & Bowles, 2008; Hansen & Beaver, 2012). Studies have cited mastery of the English language as a factor that puts students who do not speak English as their native language at home, or who speak English as a second or additional language, at risk for NCLEX-RN failure (Caputi & Engelmann, 2008; Cunningham, Stacciarini, & Towle, 2004; O'Neill, Tannenbaum, & Tiffen, 2005). On the other hand, Uyehara et al. (2007) noted that ESL background in the study sample did not contribute to NCLEX-RN failure. While a student preparing to take the NCLEX-RN is expected to meet the minimum comprehension of the English language, O'Neill (2004) asserts that a student's outcome on the exam should be determined by nursing knowledge, not by reading ability. According to O'Neill, the readability level of NCLEX-RN test items does not exceed 10th-grade reading level and is lower than what is used in many nursing textbooks.

Competency in math was also considered an important predictor of student success, both in the nursing program and on the NCLEX-RN. However, there were inconsistencies in the literature regarding a correlation between math scores on standardized exams and successful NCLEX-RN outcome (e.g., Grossbach & Kunchel, 2011; Higgins, 2005; Trofino, 2013; Yin & Burger, 2003). Because a nursing candidate's ability to perform accurate calculations of medication dosage is critical for patient safety, nursing programs often require additional math course(s) for students who do not do well on the math subscore of pre-admission standardized exams. Southern Adventist

University requires students who score less than 16 in ACT math to take additional remedial math courses. In addition, all SAU nursing students are required to pass a medication dosage calculation examination before they can begin a clinical rotation that involves medicine administration.

Romeo (2013) investigated the correlation between selected predictor variables and NCLEX-RN outcome in a study population formed using a convenience sample of AS nursing degree students (N =182). The mean age of the population was 24.81, and the majority was non-Hispanic White. The study measured the predictive ability of the following three student variables: (1) score on the comprehensive Educational Resources Incorporated (ERI) RN comprehensive exam, which contained a critical-thinking composite and six critical-thinking-skills subscales; (2) composite SAT score (verbal plus math); and (3) nursing GPA. The comprehensive ERI exam was administered prior to graduation. Of these variables, the most significant predictors of NCLEX-RN outcome were the nursing GPA (M = 3.08, $p < .001$), followed by the ERI composite score (M = 58.92, $p = .013$) and critical thinking composite score ($p = .008$). The study did not find the SAT score predictive of NCLEX-RN success (Romeo).

Grossbach and Kunchel (2011) performed meta-analysis to evaluate the predictive ability of BSN program admission variables on NCLEX-RN results. This study included data for a total of 7,159 students, which came from 31 independent samples. The predictor variables included SAT composite score, SAT verbal score, SAT math score, ACT composite score, ACT subset score for English, ACT subset score for math, ACT subset score for natural science, ACT subset score for social science, pre-nursing GPA,

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GPA after first year of nursing program, GPA for second year of nursing program, GPA for third year of nursing program, and overall nursing GPA.

The study found that of all of the variables examined, SAT composite score ($r = .46$, $n = 991$) and ACT composite score ($r = .42$, $n = 1572$) were the top predictors of student outcome on the NCLEX-RN (Grossbach & Kunchel, 2011). Those two tests had credibility intervals of 0.41-0.52 and 0.27-0.56, respectively. The researchers verified that credibility intervals "display the likely range of values that we might observe across situations….how much effects actually vary across situations" (Grossbach & Kunchel, p. 126). The study also demonstrated that the student score on each ACT and SAT subset was an indicator of NCLEX-RN outcome, especially the ACT subset for social science ($r = .45$, $n = 1312$) and the SAT verbal test ($r = .36$, $n = 1965$). Additionally, Grossbach and Kunchel concluded that the ACT composite score and the SAT composite score were better predictors of NCLEX-RN success than the pre-nursing GPA ($r = .34$, $n = 2733$).

Other studies, however, found a strong correlation between nursing GPA and successful NCLEX-RN outcome. Haas, Nugent, and Rule (2004) evaluated data for 351 students enrolled in an upper-division nursing program. Approximately 90% of the students in this study population ($N = 317$) passed the exam. In this particular study, the researchers opted to set the type I error rate (alpha value) at .10. Using discriminant analysis, with important discriminating variables selected in a stepwise fashion, the cumulative nursing GPA was found to be the only significant student variable. Candidates who passed the NCLEX-RN had a higher cumulative nursing GPA ($M = 3.3$) than those who failed ($M = 3.0$) ($p < .000$). Other variables included in this study were gender, age at testing, race, undergraduate transfer GPA, undergraduate cumulative GPA,

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and verbal and quantitative SAT scores. Analysis of the independent samples *t*-test showed that individuals who passed the NCLEX-RN had higher scores on the SAT verbal ($p = .001$) and SAT quantitative tests ($p = .082$). Graduates who passed the examination were slightly younger ($M = 26.52$) than those who failed ($M = 27.91$). Chi-square tests indicated significant differences in NCLEX-RN pass rates, according to gender ($p = .064$) and race ($p = .011$). Male test takers ($n = 7$, 17.9%) performed worse on the NCLEX-RN than females ($n = 27$, 8.7%). The student pass rate was highest among Hispanics, the smallest sample ($n = 2$), followed by Caucasians ($n = 284$), African Americans ($n = 26$), and Asians ($n = 5$) (Hass et al., 2005). Using the two-sided application of Fisher's exact test, the study also found that Caucasian students outperformed African Americans ($p = .056$) and Asians ($p = .026$) respectively.

In a study of the factors that contribute to NCLEX-RN success, Landry et al. (2010) examined BSN students enrolled in three different pre-licensure programs in San Francisco, California. The researchers compared the exam results of students enrolled in a master's-entry program in nursing for college graduates who had no previous nursing education ($n = 143$) with the NCLEX-RN results of students enrolled in satellite campus BSN ($n = 126$) and university-based ($n = 318$) nursing programs. The study found that the GPA in nursing courses ($M = 3.57$) (*OR*, 17.41; 95% CI, 1.34–225.63) and the grade in Pathophysiology (*OR*, 1.98; 95% CI, 1-01–3.91) were the only strong predictors of NCLEX-RN outcome among the university-based students. Although students in the master's-entry program had the highest overall college GPA ($M = 3.75$) out of the three groups, the final logistic regression analysis indicated that GPA did not contribute to their NCLEX-RN success; only grades in Foundations of Nursing Theory (*OR*, 12.38; 95% CI,

1.68–91.26) and in the Medical-Surgical Nursing Practicum (*OR*, 17.97; 95% CI, 1.88–172.01) were significant for this group. Although students in the satellite BSN program had a nursing GPA (*M* = 3.73) similar to those enrolled in the master's-entry program (*M* = 3.75) and an overall GPA (*M* = 3.48), the final logistic regression analysis indicated that none of the variables were predictive of NCLEX-RN outcome for this group. While student grades in core nursing courses were not necessarily predictors of NCLEX-RN success across the three cohorts, the study found among the master's-entry population a correlation between NCLEX-RN outcome and grades in Foundations of Nursing Theory, Health Assessment Theory, Medical-Surgical Theory, Medical-Surgical Practicum, Maternal/Child Nursing Theory, and Pathophysiology. Among the university-based students, the study found a moderate correlation between NCLEX-RN outcome and grades in Health Assessment Theory, Maternal/Child Nursing Theory, Medical-Surgical Theory, Pathophysiology, Pharmacology, and Psychiatric/Mental Health Theory. By contrast, among the satellite BSN program population the study found only a moderate correlation between the student grade in Pathophysiology and NCLEX-RN outcome.

The top four ethnicity including all three groups were Asians (*n* = 224), non-Hispanic whites (*n* = 180), Hispanics (*n* = 64), and non-Hispanic African Americans (*n* = 43). The mean age of students enrolled in master's-entry, university BSN program, and satellite program was 36.3 years, 31.8 years, and 37.5 years respectively. No significant differences in NCLEX-RN success among students in the three program types were traced to gender. However, significant differences in overall GPA and nursing course GPA did exist across the groups, and whether or not a student had earned a prior degree also proved statistically significant for all three cohorts. Since the courses for which

grades were identified as predictors of NCLEX-RN outcome (Pathophysiology, Foundations in Nursing Theory, and the Medical-Surgical Nursing Practicum) are taken early in the nursing curriculum, the results of this study can be used to identify students at risk for NCLEX-RN failure and to provide early interventions (Landry et al., 2010).

It is not uncommon for nursing programs to institute other standardized exams in addition to the ACT or SAT in order to assess student readiness for the NCLEX-RN. McCarthy et al. (2014) studied the correlation between the score on the Test of Essential Academic Skills (TEAS) and NCLEX-RN outcome for students from four BSN programs ($N = 794$) and concluded that NCLEX-RN outcome could be indicated by scores in each of the TEAS subcategories: reading ($r = .197$, $p < .001$), math ($r = 0.158$, $p < .001$), science ($r = .171$, $p < .001$), and English ($r = 0.103$, $p = .008$).

Alameida et al. (2011) conducted a study evaluating the correlation between the ATI RN Comprehensive Predictor assessment examinations and NCLEX-RN outcome in a diverse student population ($N = 589$). The results indicated a significant correlation between a student's score on the ATI RN Comprehensive Predictor examinations and NCLEX-RN success. Researchers who utilized other types of standardized exams reported similar findings. Beeson and Kissling (2001) and Uyehara et al. (2007), for example, found that students who passed the NCLEX-RN scored higher on the Mosby Assess Test than those who failed.

In another study, Tipton et al. (2008) included the Nursing Entrance Test (NET) results from a sample of 68 AS graduates from a community college. The NET was given to students prior to nursing enrollment to evaluate their reading and math abilities, the types of stressors they might encounter (family, social, money/time, academics, and/or

work), and their test-taker type/profile (frustrated, instructional, or independent). The study reported no correlation between NET scores among those who passed or failed the NCLEX-RN ($t(66) = .907$, $p = .368$).

Schooley and Dixon (2013) investigated the relationship between two types of HESI testing (HESI Specialty Exams and the HESI Exit Exam) and NCLEX-RN success. The study, which included data for 306 students enrolled in an AS nursing program, revealed that scores on the HESI Specialty Exam in RN Fundamentals was a stronger predictor of NCLEX-RN outcome ($p < 0.05$) than scores on the HESI (E^2). The researchers concluded that the entry-level concepts tested in the Fundamentals specialty test seemed to correlate with the basic skills nursing students must master in order to pass the NCLEX-RN. A study by Uyehara et al. (2007) identified a correlation between student performance in a nursing fundamentals course ($N = 217$, $r = .195$, $p = .0038$) and NCLEX-RN results, but not as a predictor of success. Other studies (Trofino, 2013; Landry et al., 2010; Seldomridge & Dibartolo, 2004; Penprase et al., 2013) found that student performance in a Medical-Surgical nursing course was a strong predictor of NCLEX-RN outcome.

In another study, Young and Wilson (2012) evaluated the validity of the HESI Exit Exam (E^2)for the seventh year of data-collection efforts aimed at predicting NCLEX-RN success. The sample size encompassed 4383 nursing students from 72 pre-licensure programs, which comprised 45 AS programs (62.5%), 22 BSN programs (30.56%), and 5 diploma programs (6.94%). Using 900 as the score to predict success, the study found the ability of exam version 1 (V1), exam version 2 (V2), and exam version 3 (V3) to predict NCLEX success was 99%, 96%, and 93% respectively. It was

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presumed that those who had to take V2 and V3 did not meet the minimum benchmark designated by their schools. In this study 1075 students who scored more than 900 took V1, followed by 271 students who took V2, and 148 students who took V3. Thirty-two schools that participated in this study had a benchmark less than 900, ranging from 750 to 875. Further analysis indicated that the accuracy of the HESI (E^2) in predicting NCLEX-RN success using a test score of 850 as the benchmark was 96.86%. The study gave no further elaboration on the pass rates of schools that used benchmarks lower than 850.

In 45 of the participating schools, remediation was often instituted following student failure to help students meet the established benchmark of the designated program. Remedial courses, computer-based tutoring, and NCLEX-RN review manual were commonly utilized to improve student's performance on NCLEX-RN. Retesting was enforced by 44 participating schools (97.78%). This study collected no data to evaluate the effectiveness of remedial interventions that were instituted by the nursing program.

The accuracy of the HESI (E^2) in predicting successful NCLEX-RN outcome was supported by six previous HESI (E^2) annual studies (Young & Wilson, 2012) and other studies (e.g., Harding, 2010; Yoho, Young, Adamson, & Britt, 2007). The reliability of the HESI (E^2) as measured by a Kuder Richardson Formula was 0.91, 0.98, and 0.91 for the RN exit exam versions 1, 2, and 3 respectively (Young & Wilson).

Students with higher scores on a standardized exit exam are presumed to have a higher probability of passing the NCLEX-RN. Nursing programs often implement remediation policies to improve NCLEX-RN outcome, using a student's exit exam score to guide determination of the extent of remedial interventions needed.

Spurlock and Hunt (2008), however, argued that the HESI Exit Exam as part of remedial intervention was not a strong predictor of NCLEX-RN failure and that nursing programs should not rely on one single exit score to predict NCLEX-RN outcome. In this correlational study, the researchers used retrospective descriptive design, with data collected after students took both the HESI Exit Exam and the NCLEX-RN. The final sample size for the study was 179 students. The variables included each student's HESI (E^2) score, number of attempts necessary in order to achieve the 850 benchmark, and NCLEX-RN results. The average HESI (E^2) score for the first attempt was 832.7, with a range of 473 to 1251, and the average score was 917.3 for the second attempt, with a range of 648 to 1251. It took students an average of 2.13 times to achieve a minimum score of 850. Based on a study by Nibert, Young, and Adamson, *Predicting NCLEX Success with the HESI Exit Exam: Fourth Annual Validity Survey*, the researchers predicted that roughly 94% of students would pass NCLEX-RN, but the actual pass rate was only 86.6%. Of 167 students expected to pass the NCLEX-RN, 22 students failed, and only two of the 12 students expected to fail the NCLEX-RN actually failed (Spurlock & Hunt).

The study found a significant correlation between the score on a student's first attempt at the HESI (E^2) and his or her score on the NCLEX-RN ($r_{pb} = -.0275$, $p \le .005$), but not between the student's second attempt on the HESI (E^2) and NCLEX-RN success ($r_{pb} = -.026$, $p \le .0733$). Using a logistic regression analysis, the study also found that the score on a student's first attempt to pass the HESI (E^2) can help predict NCLEX-RN success ($p \le .005$) but not failure. Hence, a nursing program requirement for students to repeat a predictor exam might not achieve the desired learning outcome. The researchers

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asserted that focusing on the sensitivity and the positive predictive value (PPV) of these values would help nurse educators know "how well the test predicts NCLEX-RN failure, both retrospectively (sensitivity) and prospectively (PPV)" (Spurlock & Hunt, 2008, p. 163). The study also suggested that a lower cutoff score of 650 should be used to predict the most accurate results, based upon this sample group. A cutoff score of 650 yielded sensitivity of .21, specificity of .97, positive predictive value of .50, negative predictive value of .89, and overall accuracy of .87. The likelihood of NCLEX-RN failure for a student who scored below 650 was magnified nearly eight times ($OR = 7.89$). In conclusion, the researchers reiterated the detrimental impact of using one single test score to indicate student readiness for graduation and to predict NCLEX-RN outcome.

Silvestri et al. (2013) conducted a descriptive exploratory study to evaluate the correlation between academic, non-academic, and self-efficacy variables and NCLEX-RN outcome. This study used Survey Monkey® to create a 109-item survey to collect the following data: demographic information, academic grades, personal and environmental factors/stressors, and self-efficacy expectations. The academic data comprised SAT total score, SAT verbal score (or SAT reasoning and test critical reading score), SAT math score, ACT exam score, grade in college chemistry, and grades in four nursing courses (Fundamentals, Medical-Surgical, Pharmacology, and Leadership Management). Specific surveys used to evaluate personal and environmental factors/stressors as well as self-efficacy expectations included the Recent Life Changes Questionnaire (RLCQ) by Miller and Rahe, the Brief Measure of Worry Severity (BMWS) by Gladstone et al., and the General Perceived Self-Efficacy Scale. Chi-square tests, logistic regression, and Pearson product-moment correlation were used to analyze the correlation between predictor

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variables and NCLEX-RN results. All data were self-reported and collected via Survey Monkey®. Although 214 participants from various BSN programs across the country responded to the survey, only 183 individuals who met the inclusion criteria (by reporting either passing or failing the NCLEX-RN) were included in the study. Of 183 participants, 159 reported they had passed the examination and 24 reported they had failed. The majority of the study participants were Caucasians ($n = 151$), and the mean age of the sample was 24.53.

Using logistic regression analysis, the study found that a student's self-efficacy expectation regarding the ability to accomplish goals while in nursing school was predictive of NCLEX-RN outcome ($OR = 1.258$, $p = 0.011$). Specific to academic variables, the study showed that the student grade in Medical-Surgical Nursing ($OR = 1.176$, $p = .021$) correlated strongly with NCLEX-RN success. Non-academic factors that proved significant in this study were home and family events ($OR = .994$, $p = .039$). Three subscores of home and family that contributed to its significance were a major change in the health or behavior of a family member ($n = 64$, 35%), a major change in living conditions ($n = 49$, 26.8%), and a change in family get-togethers ($N = 46$, 26.1%). The study also demonstrated a strong correlation between the primary language spoken and NCLEX-RN outcome (χ^2 ($n = 183$) $= 34.237$, $p = 0.000$). In this particular study, 85.7% of the participants who spoke Spanish at home ($n = 6$) failed the NCLEX-RN and 14.3% ($n = 1$) passed. A majority of the participants who spoke English as the primary language at home ($n = 152$, 89.4%) passed the NCLEX-RN, and 10.6% ($n = 18$) failed. Another important finding in relation to learning outcome and self-efficacy was a positive correlation between all academic predictors and self-efficacy, which suggested that as a

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student's grade increased, his or her self-efficacy also increased. The Pearson product-moment correlation coefficient (PPMCC) showed negative correlations between worry, personal events, and responsibilities and self-efficacy, which suggested that worry or additional responsibilities can be detrimental to student outcome in school and on the NCLEX-RN. This finding confirmed that non-academic factors can influence learning outcome; consequently, nursing students and faculty need to consider many factors that can support students both academically and non-academically.

A study conducted by Arathuzik and Aber (1998) also evaluated the association between academic and non-academic factors and student success on the NCLEX-RN. This study, however, was limited to senior students ($N = 79$) at one public university. The majority of the population comprised students who were female ($n = 65$, 82.3%), single ($n = 49$, 62%), and spoke English as their primary language ($n = 73$, 92.4%). They ranged in age from 21 to 52 years, with a mean age of 29 years. Four instruments were utilized to derive non-academic factors: (1) a demographic data sheet to collect participants' demographic information, (2) the Internal Block Scale and (3) the External Block Scale to evaluate personal challenges experienced during school, and (3) the Study Skills Self-Efficacy Scale (SSSES) to measure efficacy beliefs about study skills. University records provided academic information, including grades in senior theory and clinical courses, cumulative GPA, and NCLEX-RN outcome.

Of the academic variables they tested, Arathuzik and Aber (1998) found that higher cumulative GPA ($r = .275$, $p = .05$) correlated to NCLEX-RN success. Of the non-academic variables they examined, English as the primary language ($r = .253$, $p = .05$), external blocks (family demands) ($r = -.293$, $p = .05$), internal blocks (emotions: anxiety,

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anger, guilt, loneliness) ($r = -.240$, $p = .05$), and a sense of competency in taking tests involving critical evaluation and thinking ($r = .245$, $p = .05$) correlated to NCLEX-RN. The study affirmed that language background as well as emotional or personal stressors contribute toward failure of the NCLEX-RN.

Not surprisingly, nursing graduates may experience a wide range of emotional reactions following NCLEX-RN failure. Using a hermeneutic qualitative approach, Poorman and Webb (2000) discovered three themes (living the failure, wanting, and daring to hope) that described the experiences of 10 students who failed the NCLEX-RN. The study participants included seven females and three males between the ages of 22 and 41 ($M = 27.7$). Their educational background included three BSN, three AS, and four diploma programs. The study was conducted as part of an NCLEX-RN remediation program focusing on cognitive behavioral interventions, metacognitive and reasoning exercises, testing taking skills, and study skills. The theme of "living the failure" reflected the adverse emotions recorded in many participants' journal entries. Some felt not only the angst of guilt and regret as a result of detaching themselves from their loved ones while in school, but also hopelessness and insecurity due to losing their identity as a nurse. According to the participants, some experienced complete abandonment by their former faculty. Once they graduated and left the institution, they had no one to consult for help. Collaboration among students and faculty after graduation, and especially during an unfortunate event such as NCLEX-RN failure, can be a career-saving intervention.

In another qualitative study, Eddy and Epeneter (2002) explored the NCLEX-RN testing and nursing education experiences of 19 students who graduated from a private

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BSN program in Oregon. The sample was composed of 10 students who passed and nine who failed the NCLEX-RN—all on first attempt. Demographic data revealed 15 females and four males whose ages ranged from 21 to 53 years ($M = 29.7$). Three distinctive themes (internal-learner issues, examination issues, and programmatic issues) were used to describe study findings.

Participants reported experiencing a wide range of emotions during the test, including depression, panic, anger, uncertainty, stress, anxiety, ambivalence, and worry. Regarding internal-learner issues, the researchers gained important insights into students' personal experiences. Students who were proactive in the learning process were also in control of their emotions, especially prior to and during the NCLEX-RN exam. Consequently, they passed the exam. On the contrary, students who failed, felt pressured to take the exam before they were ready, were more prone to influences of internal and external stressors, and were more likely to blame others for their failure. They "felt unprepared for the NCLEX-RN and needed more direction in that area" (Eddy & Epeneter, p. 277). In regard to examination issues, all of the study participants agreed that nothing could have prepared them to answer NCLEX-RN-type test items. The incongruence between "the depth required in course examinations and the breadth experienced on the NCLEX-RN" (p. 277) took the participants by surprise. Student concerns related to their nursing program included a lack of practice in areas involving prioritization and delegation, inadequate NCLEX-RN preparation, and insufficient opportunity to prepare for the exam due to the intensity of coursework required during their last semester. This study affirmed that active learning strategies by students lead to greater satisfaction in the learning outcome. While the students were ultimately

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accountable to prepare for the exam, they needed help from their nursing faculty to develop test-taking strategies.

The study included three individuals for whom English was not their primary language, and all three failed the NCLEX-RN on first attempt. One of the students reported difficulty comprehending test questions, but the study provided no additional discussion of the candidate's language background and whether or not any additional attempt(s) were made to pass the exam. The study also did not report the nursing program's overall pass rate, which would include an additional 75% of students in 1998. An examination of NCLEX-RN delay found that individuals who passed the exam took it within six weeks of graduation ($M = 5.55$, $SD = 3.21$), or approximately two weeks later than those who failed ($M = 3.77$, $SD = 1.79$). However, statistical analysis revealed no significant correlation between a delay in taking the NCLEX-RN and the candidate's exam results ($t(18) = -1.46$, $p = .16$) in this study population (Eddy and Epeneter, 2002).

On the contrary, a study by Woo et al. (2009) found a strong correlation between an NCLEX-RN candidate's "lag time" (p. 23) and examination outcome. This study included 176,539 pre-licensure RN graduates who took the NCLEX-RN between July 1, 2006, and June 30, 2008. In this sample, most candidates waited approximately 35 days ($SD = 28.30$) after receiving clearance (authorization) to take the NCLEX-RN. This study found that the longer graduates waited to take the examination, the harder it was for them to pass it ($b = 0.013$, $p < .0001$). While the lag time did not necessarily lead to failure of the NCLEX-RN, the researchers believed that delay would compromise the test takers' ability to apply their nursing knowledge on the examination and would lessen their likelihood of achieving a passing score.

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Several studies have tested for correlation between specific demographic data such as age, gender, and ethnicity and NCLEX-RN outcome. While demographic factors are non-modifiable, the findings are contributing to a richer discussion of NCLEX-RN preparation. Beeson and Kissling (2001) found that in a data sample for 505 students, older students ($M = 26.4$, $SD = 6.6$) performed better on the NCLEX-RN than younger students ($M = 24.5$, $SD = 6.6$). The upper age varied from study to study; those who did better in a study performed by Trofino (2013) were older ($M = 24.79$). Haas et al. (2003) claimed that younger students performed better; however, the average age in this study population was 26.52 years. By contrast, Beeman and Waterhouse (2001) did not find any correlation between age and NCLEX-RN outcome. In addition to age, Higgins (2005) found no significant correlation between gender or ethnicity and NCLEX-RN results. Likewise, Landry et al. (2010) did not find a correlation between gender and NCLEX-RN success in three different pre-licensure programs (master's entry, university-based, and satellite BSN). Haas et al., however, found that men did not do as well as women on the NCLEX-RN ($p = .64$). Using Fisher's exact test statistical analysis, Haas et al. also found that African American and Asian students failed at a significantly higher rate than Caucasian students. On the other hand, Uyehara et al. (2007) did not find ethnicity as a predictor of NCLEX-RN outcome.

NCLEX-RN Pass Rates

Observers note that the NCLEX-RN pass rate among first-time test takers who were educated within the United States dropped every time the examination passing standard was adjusted. The most recent changes to the passing standard took effect on April 1, 2013, and will remain in place until March 31, 2016 (National Council of State

Boards of Nursing, 2013h). As a result, the national NCLEX-RN pass rate for U.S.-educated graduates first-time test takers dropped from 90% ($N = 150,266$) in 2012 to 83% ($N = 155,098$) in 2013—a drop of 7% (National Council of State Boards of Nursing, 2013g). Similar patterns were found as a result of the three previous changes to the NCLEX-RN passing standard. The NCSBN data (National Council of State Boards of Nursing, 2013g) indicated a drop of approximately 2%, 3%, and 1% in pass rates from the previous year for 2004, 2007, and 2010 respectively. Improvements in the NCLEX-RN national pass rates were noted in following years. The data revealed pass rates of 87% (an increase of 2%) in 2005, 87% (an increase of 1%) in 2008, and 88% (and increase of 0.5%) in 2011 (National Council of State Boards of Nursing, 2013g). On the other hand, the national pass rates for U.S.-educated test takers who failed and had to repeat the examination remained low. The NCSBN (National Council of State Boards of Nursing, 2013g) data showed that the pass rates for graduates who had to retake the examination between 2009 and 2013 ($N = 140,790$) were in the 47% to 56% range. Changes in NCLEX-RN passing standards inevitably led to fewer graduates entering the workforce. Further research attempts on factors that lead to NCLEX-RN success or failure can improve nursing education and NCLEX-RN outcome in the long run.

Consequences of NCLEX-RN Failure

The consequences of failing the NCLEX-RN can be far-reaching, affecting not only individual students but also nurse educators, nursing programs, hospitals, and patients who need highly qualified professionals to manage their care. Nursing programs with lower NCLEX-RN pass rates were often presumed to deliver inferior-quality instruction (Aucoin & Treas, 2005; Pennington & Spurlock, 2010). Nursing programs

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might face probation (*Tennessee Board of Nursing Position Statements*, 2012) if the NCLEX-RN pass rates of their students who were first-time test takers did not meet the benchmark set by the governing bodies. In addition, prospective students and their parents may infer that three to four years of study at a school with low pass rates is a poor educational investment. Hence, poor NCLEX-RN pass rates can hamper a university's recruitment and retention efforts.

Nursing graduates who cannot be employed as registered nurses are frequently faced with a significant economic burden. The cost of completing a pre-licensure nursing degree for registered nurses can be as high as $15,000 per semester in a baccalaureate program (Roa, Shipman, Hooten, & Carter, 2011) or as low as $3,000 per semester in a community college (Mullins, 2012). These educational expenses vary according to type of institution. Graduates who fail to pass the NCLEX-RN exam on first attempt can expect to face additional costs if they pursue licensure. For example, a candidate must pay $200, plus additional licensure fees required by the governing state board of jurisdiction, to retake the NCLEX-RN (National Council of State Boards of Nursing, 2013e). These fees can easily total nearly $500 for each additional application to take the exam. While the Bureau of Labor Statistics (2014b) estimated an annual mean salary of $69,910 for registered nurses, this earning power could serve as an immediate return on their investment if nursing candidates pass the exam on first attempt (Roa et al., 2011). This annual mean salary for registered nurses may vary based on the worker's location, employment type, education background, and experience. For example, the annual mean wage for registered nurses in Tennessee was $56,730 (Bureau of Labor Statistics, 2014d), which is approximately $40,000 less than for registered nurses in California (Bureau of

Labor Statistics, 2014c). Yet, according to a hospital representative from Chattanooga, Tennessee, a new AS graduate working full-time earned approximately $39,000 (A. Thompson, personal communication, April 7, 2014). Unfortunately, in this particular employment setting there is no difference in salary based on AS or BSN nursing degree completion.

The financial burden related to NCLEX-RN failure can be overwhelmingly taxing for healthcare facilities as well, especially if newly hired graduates who fail the exam are no longer permitted to perform care within the scope of practice of registered nurses. According to Greenspan, Springer, and Ray (2009), the cost of loss in productivity could reach as high as $90,000—tripling the cost of hiring and preparing a graduate to reach optimal performance. In another study by the Nursing Executive Center, the economic impact of loss in productivity resulting from hiring new graduates ranged from $42,000 to $64,000 (as cited in Lindy & Reiter, 2006). These costs are staggering considering the fact that in 2013 alone, nearly 17% of NCLEX-RN applicants failed the exam on their first attempt (National Council of State Boards of Nursing, 2013g).

Patient safety is undoubtedly paramount, and nurses play a vital role in an increasingly complex and sophisticated medical-technological system. The release of *To Err is Human: Building a Safer Health System* by the Institute of Medicine in 1999 generated greater interest in and incentive for promoting patient safety (Wachter, 2004). Yet, if new graduates continue to fail to meet the minimum requirements for nursing practice, patient health and safety will be compromised. The literature (Aiken et al., 2002; Buerhaus, Donelan, Ulrich, Norman, DesRoches & Dittus, 2007; Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002; Stanton & Rutherford, 2004)

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acknowledged that a nursing shortage would impact the quality and safety of patient care. In many cases, it may lead to adverse patient outcomes. Stanton and Rutherford (2004), for example, reported a higher occurrence of nosocomial infections (such as urinary or respiratory infections) among surgical patients in hospitals with inadequate RN staffing. RNs spend more time with patients than other healthcare providers do, and they often perform actions critical to their patients' well-being. Nurses are "the patient's last line of defense" (Benner et al., 2010, p. 2).

The impetus to ameliorate a potential nursing shortage provides a valid reason to increase enrollment in nursing programs. Unfortunately, such an approach, as chronicled by Taylor, Loftin, and Reyes (2014), led to a higher acceptance of nursing candidates who met the minimum admission criteria but were less prepared for rigorous academic challenges. When the NCLEX-RN pass rate for graduates from the nursing program studied by Taylor et al. dropped below the acceptable benchmark set by nursing governing bodies, the program was placed on probation. Subsequently, the nursing program had to adopt stringent admission and progression policies and eliminate its third summer admission cohort in order to improve the pass rate. Taylor et al. argued that the NCLEX-RN pass rate for first-time test takers did not necessarily correlate with excellence in nursing education. This sentiment was shared by Giddens (2009) and Spurlock (2013), who demanded better methods for evaluating nursing program success and student competency (see also American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999). A nursing program's reliance on first-time pass rates alone not only undermined teaching creativity and accountability but also led to justification of progression policies that

aimed to prevent disenfranchised students from taking the NCLEX-RN (Giddens, 2009; Spurlock, 2013). Elimination of minority students and others with poor test-taking skills from a nursing program for the sake of achieving a high pass rate among first-time test takers would further challenge the notion of workforce diversity and nursing professional sustainability (Giddens). In addition, Giddens observed that a nursing program's progression policies often required the use of additional high-stakes exams by external vendors to assess student readiness for the NCLEX-RN—a practice that negates the main purpose of nursing education.

Helping students to succeed professionally and to become contributing members of society should not end at graduation. Taylor et al. (2014) argued that the mark of excellence in nursing education should involve ongoing support for students who might not pass the NCLEX-RN on their first attempt. Taylor et al. noted, "Most nurse educators can point to examples of average students who may have struggled through the nursing program and failed the NCLEX-RN on first attempt but who have become successful and highly respected nurses nonetheless" (p. 339). Therefore, by adding documentation of student attrition and completion rates, including the second-attempt results for students who fail the NCLEX-RN on their first attempt, nursing programs could provide a better measure of their success (Giddens, 2009; Spurlock, 2013; Taylor et al., 2014).

Summary

Many compelling studies demonstrate the potentially adverse impact of a future nursing shortage. Unfortunately, bringing more nurses into practice (or preventing them from leaving the profession) is a complex process. Most nurses do not remain in practice, especially in an acute-care setting, as they get older. Work-related and/or personal issues

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have led to poor nursing retention. From a nursing education perspective, issues such as admission and progression policies, accreditation requirements, a lack of qualified educators, and/or limitations in clinical sites able to accommodate additional qualified applicants further complicate this process.

Current NCLEX-RN literature was fraught with discrepancies. Several studies reported contradictory findings regarding a correlation between independent and dependent variables, and they did not agree on the methodological approach upon which to draw evidence-based interventions. Despite inconsistencies in the literature related to sample size, study population background, selection of variables, or study design, discussions on this topic should remain open. Unidentified factors specific to a study population must compel nurse educators to persevere and search for answers that befit their students and academic needs.

Thus far, no peer-reviewed studies have shown a breach in patient safety that was attributed to a nurse who failed the NCLEX-RN on first attempt. Educators should reconsider and continue to discuss the value of the NCLEX-RN pass rates of first-time test takers as a sole indicator of a nursing program's success and/or ability to deliver superior nursing education. Ultimately, the complexity of academic and non-academic factors that influence a student performance on the NCLEX-RN, combined with an urgency to find solutions that will help students succeed academically and professionally, will undoubtedly inspire additional research. In conclusion, nursing program administrators, faculty, and students must be actively involved across the nursing education continuum in order to achieve a mutually positive learning outcome.

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CHAPTER III

RESEARCH DESIGN AND METHODS

Introduction

This study sought to identify academic and non-academic factors that predict successful NCLEX-RN result among traditional college students who completed the associate of science nursing program at Southern Adventist University. This chapter presents the research design of the study. The following topics: research questions, setting, population and sample, variables, data collection, treatment of data, data analysis, proposed time line, and summary are also included.

Research Design

This study utilized descriptive correlational and logistic regression analyses to explore relationships between independent and dependent variables. The independent and dependent variables were comprised of AS students' data from Southern Adventist University. The decision to select a correlational design was supported by three propositions. (1) Correlational study allows the researcher to collect, describe, and evaluate a large number of variables (Polit & Beck, 2008). More than 100 variables were collected in this study. (2) Correlational study allows the researcher to be selective in the number of variables he or she wishes to evaluate (Houser, 2008). (3) Descriptive correlation study is particularly useful to evaluate the relationships among variables (Houser; Polit & Beck).

The decision to utilize logistic regression was supported by five propositions. (1) Logistic regression provides an estimate of likelihood of independent variables to predict an event (dependent variable) (Polit & Beck). (2) Logistic regression can use either categorical or continuous variables (Howell, 2013). This study has both using a combination of categorical and continuous variables. (4). Logistic regression makes no assumption about the distribution of predictor variables (Howell). (4) Logistic regression presents statistical correlation of independent and dependent variables as expressed in Wald Chi (Bannon, 2013). (5) Logistic regressions provides overall model of fit as presented in a -2 log likelihood statistic (Howell; Osborne, 2015).

Chi-square test for association between selected independent variables and NCLEX-RN outcomes (pass or fail) were also utilized. The selected variables (ESL/language background and number of attempts to complete core nursing courses) were not a part of the nursing program's course sequence. Chi-square test for association tests if two categorical variables are associated and "makes no assumptions about the shape of the distribution" (Cronk, 2012, p. 62). Additional data analysis, results, and interpretation are discussed later in this chapter and in chapter 5.

Research Questions

Four research questions were formulated to generate specific information regarding factors that could potentially influence successful NCLEX-RN outcome among AS nursing graduates at Southern Adventist University. The research questions are as follows:

1. Do non-academic variables contribute to successful NCLEX-RN outcomes?

2. Which pre-nursing admission variables contribute to successful NCLEX-RN outcomes?

3. Which nursing program variables contribute to successful NCLEX-RN outcomes?

4. Which set of variables, from all models generated, contribute to successful NCLEX-RN outcomes?

Setting, Population and Sample

Setting

The study took place at Southern Adventist University, a private, religious-affiliated university located in southeast Tennessee. The university is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools and various other organizations. The associate of science degree as well as the other undergraduate and graduate nursing programs at SAU are accredited by the Accreditation Commission for Education in Nursing (ACEN).

Population and Sample

The target population was the AS nursing students at Southern Adventist University. These students were accepted into the pre-licensure nursing program at Southern Adventist University and studied during consecutive fall and winter semesters, completing the program between the winter 2006 and winter 2014 semesters. After exclusion criteria, a total of 838 students' data were included in this study.

<div align="center">**Variables**</div>

The literature has associated a number of academic and non-academic factors with successful NCLEX-RN outcome. The selected academic variables in this study were required components of SAU nursing program's admission, progression, and graduation.

Academic Variables

Academic variables for the study were comprised of pre-nursing and nursing program criteria. Pre-nursing admission criteria included cumulative grade point average (GPA), ACT English, reading, and math scores, and grades in pre-requisite courses. Students who took the SAT exam had their composite, math, and verb scores converted to the ACT composite, math, and English respectively in the Student Information System. The pre-requisite courses included the following courses: BIOL 101 (Anatomy & Physiology 1), BIOL 102 (Anatomy & Physiology 2), BIOL 225 (Basic Microbiology), PSYC 128 (Developmental Psychology), NRNT 125 (Nutrition), and CHEM 111 (Survey of Chemistry 1). Any substitution for a pre-requisite course accepted by the SAU nursing program was also collected for this study. See Table 1 for description of minimum grades or test scores requirement.

Nursing program criteria included the following eight core nursing courses: NRSG 106 (Fundamental I), NRSG 107 (Fundamental II), NRSG 126 (Adult Health I), NRSG 130 (Mental Health), NRSG 212 (Childbearing Family), NRSG 226 (Adult Health II), NRSG 231 (Child Health), and NRSG 305 (Adult Health III). In addition, HESI (E^2) scores and NCLEX-RN delay, as part of licensure preparation, were also collected as part of the academic variables. See Table 1 for description of minimum grades or test scores requirement.

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Non-Academic Variables

Three of the non-academic variables for this study were comprised of

demographic data. The demographic data collected were as follows: age at the time of

enrollment in NRSG 106 (Fundamentals I), gender, and ethnicity. The study also

evaluated potential correlation of language comprehension or ESL (English as a second

language) background, and the number of attempts to complete core nursing courses.

According to the nursing program policy, there is a limit in the number of attempts in

completing the core nursing courses (Undergraduate Catalog [SAU] 2013-2014). A

student may only repeat one failed nursing course. The student will not be allowed to

progress if he or she had a second nursing failure. A withdrawal from a nursing course

that is being repeated is considered a course failure.

<div align="center">

Data Collection

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This study utilized students' data from Southern Adventist University School of

Nursing. The admission, progression, and graduation data were maintained by the

Director of the Admission and Progression. All academic and non-academic data were

extracted from the Student Information System. The NCLEX-RN results were collected

from the NCLEX-RN Pass Rates Quarterly Reports and made available by the National

Council of State Boards of Nursing (NCSBN) to every board member of jurisdictions.

Students' data that met the inclusion criteria were carefully analyzed and entered

into an Excel spreadsheet. Information that was not pertinent to the study was

subsequently eliminated. A data dictionary was created to organize data collection and

maintain accuracy of information. Once data collection was completed, the information

was migrated into SPSS for further statistical analysis. The grading and grade point

values used in this study match the values used by the university. The letter A is equal to 4.00 grade points per hour; A- is equal to 3.70 grade points per hour; B+ is equal to 3.30 grade points per hour; B is equal to 3.00 grade points per hour; B- is equal to 2.70 grade points per hour; C+ is equal to 2.30 grade points per hour; C is equal to 2.00 grade points per hour; C- is equal to 1.70 grade points per hour; D+ is equal to 1.30 grade points per hour…and F is equal to 0.00 grade points per hour.

Variation of data or missing information were discovered during data collection. Prior to fall 2013, students could use the SAT exam to meet the admission requirement. Those who took the SAT exam had the composite, math, and verbal scores converted to the ACT composite, math, and English respectively in the Student Information System; the highest scores were entered into the admission calculation formula. Approximately 200 students from the study population who took the SAT were required by the nursing program to take the Nelson Denny reading test to replace the missing ACT reading sub-score. In this study, the Nelson Denny reading test, however, was not converted into the ACT reading and subsequently removed from the study for two reasons. (1) The Nelson Denny reading test was not comparable with the ACT reading subsection (A. Lopez & N. Agnetta, personal communication, October 1, 2014). (2) The minimum sample requirement to perform a full model logistic regression analysis without the ACT reading was adequate to achieve a power of 0.8 (see Treatment of Data below).

SAU nursing program has maintained a thorough list of students NCLEX-RN test dates and results. Missing NCLEX-RN results of graduates who sought licensure from states other than Tennessee were discovered during data collection. Missing results were further searched online by entering the students' full name into a website that was made

available by the NCSBN or a website for professional licensure verification from each state of original licensure application. In some instances, original NCLEX-RN licensure release dates were substituted for missing test dates. The delay between test dates and original NCLEX-RN licensure release dates online may vary from two to seven days.

Additional data verification such as course forgiveness by the admission committee was performed by evaluating students' paper folders housed in the archive room in the nursing building. Course forgiveness was granted under special circumstances, especially if grades in courses not required for the nursing program, were lowering the applicant' admission cumulative GPA. In this study, only the cumulative GPA listed on the Student Information System was entered into the Excel spreadsheet. Therefore, the actual number of students who received course forgiveness in this study was unknown. Additional explanation of variation in data that did not match the nursing program admission requirements and/or modifications that were made on variables in this study are listed below.

Beginning of fall 2010, CHEM 111 (Survey of Chemistry I) was a required course for AS nursing admission. However, other courses were accepted in place of this course. These courses included: CHEM 151 (General Chemistry 1), CHEM 152 (General Chemistry II), CHEM 115 (Introductory Chemistry), CHEM 112 (Survey of Chemistry II), CHEM LD (Transfer Equivalency Chemistry), and HS CHEM (High School Equivalency Chemistry). HS CHEM was no longer a part of the admission requirement.

NRNT 125 (Nutrition) was the required course for the program progression. There were a variety of Nutrition courses accepted in place of NRNT 125. Some students

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took HLNT 135 (Nutrition for Life Enhanced), FDNT 125 (Nutrition), NRNT 135 TR (Nutrition Transfer), or NRNT UD (Nutrition Upper Division Transfer Equivalent).

PSYC 128 (Developmental Psychology) was a requirement that must be completed within a year of nursing program enrollment. The following four courses were accepted in place of this course: PSYC 129 (Developmental Psychology for Nursing), PSYC 122 (General Psychology), PSYC 101(Psychology of Personal and Social Adjustment), and PSYC UD (Psychology Upper Division Transfer Equivalent).

BIOL 225 (Basic Microbiology) was another required course that must be completed within 6 months prior to graduation. The following three courses were accepted in place of this course: BIOL 330 (General Microbiology), BIOL 125 (Basic Microbiology), and BIOL UD (Biology Upper Division Transfer Equivalent).

Several students who completed one of the pre-requisite courses elsewhere received a "Pass", and no other grade was assigned in their transcript. The missing grade was entered as .00 in the Excel file (see Table 7). Two students received a grade of C-, which was below the minimum program requirement (see Table 1 for details of program admission or progression requirements). Since copies of paper transcript were not available to verify the grades, 1.70 grade points per hour which equal to a C- was entered into the Excel spreadsheet (see Table 7). Both students who did not repeat the course have since graduated and passed the NCLEX-RN on their first attempt.

Treatment of Data

Data were entered by Information System (IS) personnel into a secure Excel spreadsheet to ensure security and accuracy of the information. Only the lead researcher, IS personnel, and the dissertation committee members had access to the data. Data and

references that may lead to the identification of individual student will not be revealed in future presentations or reports of this study. Data were encrypted and backed up. NCLEX-RN records were kept a locked drawer in the lead researcher's office and returned to the school of nursing as soon as data collection and analysis were completed.

Data Analysis

A descriptive statistical analysis was performed to analyze students' academic performance and non-academic data. Logistic regression analysis was used to predict students' performance on the NCLEX examination. According to Polit and Beck (2008), the logistic regression approach "uses maximum likelihood estimation" (p. 629) of an outcome to take place based on given circumstances. The dependent variable was dichotomous—yes or no in the students' outcomes on their first attempt to pass the NCLEX-RN. The independent variables were a selected number of academic and non-academic factors. The academic variables were reflective of SAU nursing program requirement.

According to Howell (2013), "power is the probability of correctly rejecting a false H_0" which ideally needs to be "near 0.80" (p. 230). Power may function as an Alpha, an approximation to a sample size, or "the true alternative to hypothesis" (Howell, p. 232). This study aimed for power analysis of 0.80. An Alpha (α) of 0.05 was utilized for the level of significance to reduce the risk of type I errors. Power analysis is needed to ensure proper estimation of sample size of a study and to reduce the risk of type II errors (Howell; Polit and Beck, 2008). Based on the work of Hsieh, Block, and Larsen (1998), a minimum sample size of 300 was needed to achieve power of 0.8 and a medium effect size. Osborne (2015), on the other hand, recommended a sample size of at least 500

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cases for a robust outcome. For this study, I included all available data from winter 2006 to winter 2014 which yielded more than the minimum recommended sample size by Hsieh et al. or Osborne.

Five logistic regression models comprised of demographic data and academic variables were performed. A logistic regression model utilizing a hierarchical entry approach (Osborne, 2015) was created and followed by one restricted model. Additional steps were taken to ensure accurate data entry and analysis. Clear criteria for all appropriate categorical data were established. For example, in response to the dichotomous dependent variable of pass or fail on students' first attempt to pass the NCLEX-RN, the coding for pass is "1" to represent the desired outcome and "0" for fail.

Time Line

Data collection and analysis began soon after approvals were received from the IRB and dissertation committee. The initial study population was to include fall 2005 – fall 2013 cohorts. Due to missing information from fall 2005 cohort and availability of winter 2014 NCLEX-RN data, an IRB modification was filed. The study now includes data from winter 2006 to winter 2014 cohorts.

Summary

The purpose of this study was to investigate the correlation between academic and non-academic variables and successful NCLEX-RN outcomes among the AS nursing graduates from an accredited, private, religious-affiliated university located in southeast Tennessee. Since the majority of peer-reviewed literature findings on NCLEX-RN outcomes for the past decade have focused on the BSN programs (Trofino, 2013), little is

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known about predictive variables that can help traditional AS students such as those at Southern Adventist University.

This study aimed to provide a thorough evaluation of students' academic and non-academic characteristics. Logistic regression and Chi-square test for association were utilized to answer research questions for this study. A descriptive statistical analysis of the demographic data was also performed to evaluate the academic and non-academic variables of the population. Formulation of strategic interventions, based on the results of this study, might ultimately lead to improvement in NCLEX-RN outcome among the young nursing student population.

CHAPTER IV

RESULTS

Introduction

The purpose of this study was to identify academic and non-academic variables
that may predict successful performance on the National Council Licensure Examination
for Registered Nurses (NCLEX-RN) among traditional college students. This chapter
addresses the results of the study in two segments. The first segment presents the
demographics analysis of the population and variables included in the study. The second
segment presents the findings based on research questions and the analysis approach for
the study.

Participant Characteristics

The study sample consisted of nursing students who were accepted into the
associate of science (AS) nursing program at Southern Adventist University (SAU)
during consecutive fall to winter or winter to fall semesters, completing the program
between winter 2006 and winter 2014 semesters. There were 884 student records
evaluated and analyzed for the inclusion criteria of this dissertation study. Inclusion
criteria included students with a recorded or verifiable NCLEX-RN result (pass or fail)
and no older than 30 years of age upon enrollment in the NRSG 106 (Fundamentals I)
course. Exclusion criteria included students who were accepted into the nursing program
through the university's Summer Study Option (SSO), held a professional nursing license

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such as Licensed Practical or Vocational Nursing, or competed level I core nursing courses (NRSG 106 or NRSG 107) elsewhere. A total of 838 student records were entered into the final cohort for this study.

Demographic Characteristics

This sample (*N* =838) was representative of the general undergraduate student population enrolled in the AS nursing program at SAU. Approximately 69% (*n* = 579) completed their secondary education from a Seventh-Day Adventist (SDA) academy (high school) (see Table 2). Thirty students did not include name or academy background. Based on being more likely to graduate from a SDA academy, no changes were made in the demographic description table. Approximately 34% of the graduates (*n* = 283) listed Tennessee as their home state. The next top five home states were represented by students from Florida (*n* = 94, 11%), California (*n* = 93, 11%), Georgia (*n* = 50, 6%), Michigan (*n* = 24, 3%) and North Carolina (*n* = 24, 3%). Figure 2 presents home state information of the population.

The demographic information for gender, age upon enrollment in NRSG 106, and ethnicity were included as part of independent variables in this study (see Table 3). According to the student records, more than half of this population (75.2%) was female (*n* = 630). The ages ranged from 17 years to 30 years of age (*M* = 20.00) upon enrollment in the NRSG 106 (Fundamentals 1) course. The ages upon graduation ranged from 19 years to 32 years of age (*M* = 21.95), and the ages upon NCLEX-RN testing ranged from 19 to 32 (*M* = 22.15). The majority was comprised of 548 Whites, not of Hispanic origin (65.4%). Of the remaining students, 116 were Hispanics (13.8%), 89 Asians/Pacific Islanders (10.6%), 67 Blacks, not of Hispanic origin (8%), and 18 missing or other

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(2.1%). American Indians/Alaska Natives and those who did not include their ethnicity or race in the Student Information System were listed as missing or other in this study.

Table 2

Demographic Description of Secondary Education Type

High School Type	n	%
Academy	30	3.6
Foreign High School	17	2.0
GED	29	3.5
High School	96	11.5
Home Schooled	36	4.3
SDA Academy	579	69.1
Unknown	51	6.1
Total	838	100

Academic Achievement Indicators

ACT Test Scores

Prior to Fall 2013, students who took the SAT examination had their composite, math, and verbal scores converted to the ACT composite, math, and English respectively. The ACT composite scores ranged from 14 to 34 with a mean score of 22.85 ($SD = 3.48$). The ACT math scores ranged from 13 to 35 with a mean score of 21.38 ($SD = 3.74$). The English scores ranged from 13 to 25 with a mean score of 23.68 ($SD = 4.48$). Students

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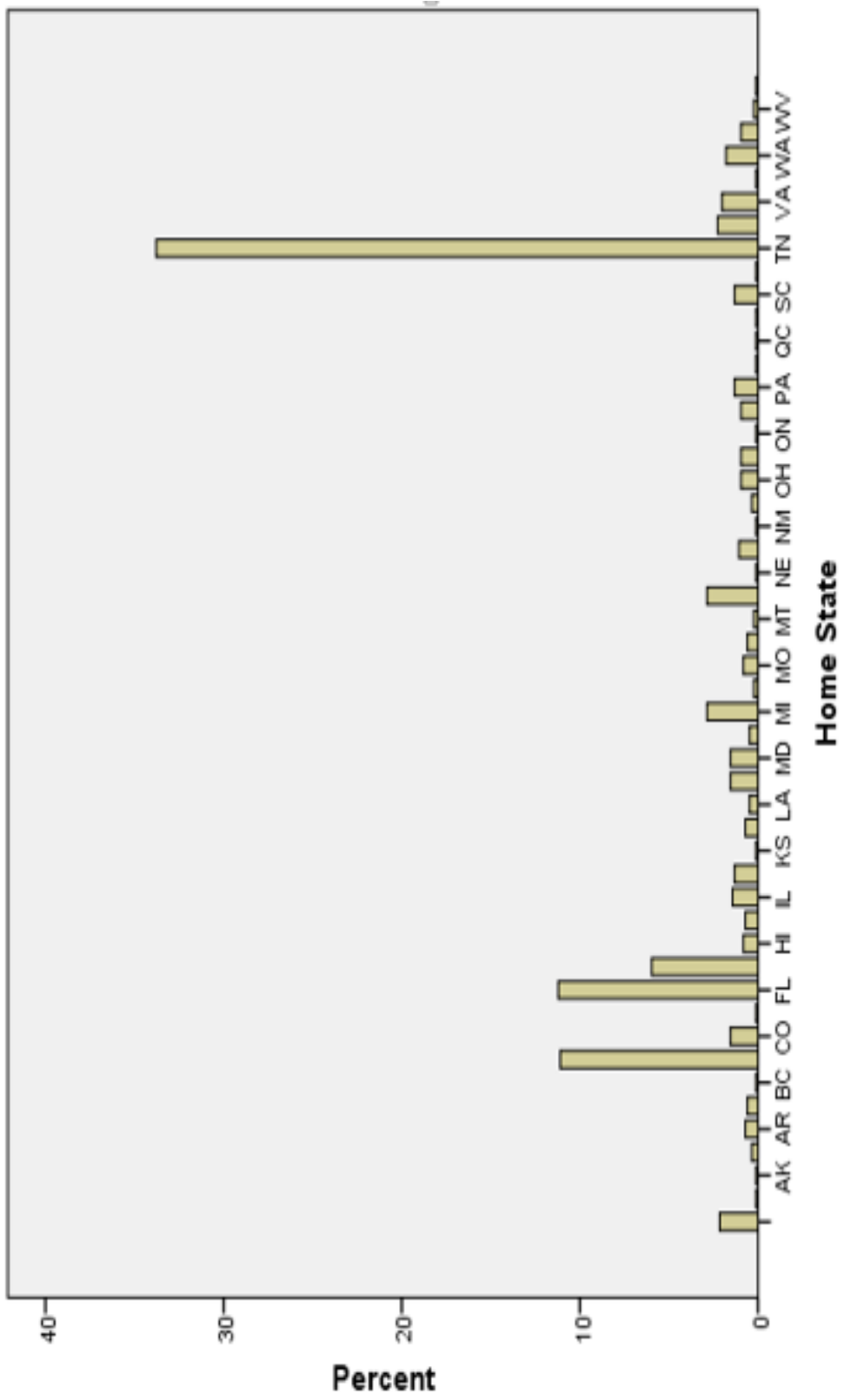
Figure 2. Home State Background of the Population.

Table 3

Comparison of NCLEX-RN Outcomes by Age, Ethnicity, and Gender (Non-academic Variables)

Demographic		Pass		Fail	
		n	%	*n*	%
Age	16-20	586	75.9	46	69.7
	21-25	161	20.9	17	25.8
	26-30	25	3.2	3	4.5
	Total	772	100	66	100
Gender	Female	586	75.9	44	66.7
	Male	186	24.1	22	33.3
	Total	772	100	66	100
Ethnicity	Caucasian, Non-Hispanic	523	67.7	25	37.9
	Hispanic	100	13.0	16	24.2
	Asian/Pacific Islander	79	10.2	10	15.2
	Black, Non-Hispanic	56	7.3	11	16.7
	Missing	14	1.8	4	6.1
	Total	772	100	66	100

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who took the SAT and Nelson Denny reading test resulted in 157 missing ACT reading test scores in this study. Reading test scores for students with documented ACT exam scores ranged from 11 to 36 (*M* = 24.31, *SD* = 5.08). Approximately 8 to 10 students had a missing ACT comprehensive, English, or math test score from their records due to transferable college credit hours prior to nursing admission (Undergraduate Catalog [SAU] 2013-2014). Table 4 presents a comparison of NCLEX-RN results (pass or failure) based on documented ACT scores.

Table 4

Comparison of NCLEX-RN Outcomes by ACT Scores

	Pass			Fail		
	n	*M*	*SD*	*n*	*M*	*SD*
ACT Composite	765	23.05	3.461	65	20.51	2.745
ACT English	764	23.92	4.508	65	20.78	2.902
ACT Math	765	21.48	3.748	65	20.12	3.462
ACT Reading	628	24.77	4.999	53	20.15	4.016

Grade Point Average (GPA)

The nursing program used the cumulative GPA as a part of admission calculation. The cumulative GPA of the population ranged from 2.6 to 4.0 with a mean of 3.4 (*SD* = .33). This cumulative GPA was comprised of SAU and transfer credits. Major GPA which included core nursing course grades of the study population ranged from 2.67 to 4.00 with a mean of 3.33 (*SD* = .34). Each student must maintain a minimum nursing

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GPA of 2.3 and cumulative GPA of 2.50 for graduation (Undergraduate Catalog [SAU], 2013-2014). The GPA for pre-requisite courses (BIOL 101, BIOL 102, CHEM 111, NRNT 125, and PSYC 128) of this population ranged from 2.20 to 4.00 with a mean of 3.17 ($SD = .44$) (see Table 5 for a complete overview of NCLEX-RN outcomes comparison based on selected GPA in this population).

Table 5

Comparison of NCLEX-RN Outcomes by GPA

	Pass			Fail		
	n	*M*	*SD*	*n*	*M*	*SD*
Nursing Core GPA	772	3.38	0.33	66	3.03	0.19
Nursing Major GPA	772	3.36	0.33	66	3.02	0.19
Pre-requisite GPA	772	3.20	0.44	66	2.90	0.35
Admit. Cum. GPA	772	3.39	0.33	66	3.15	0.24

ESL/Language Background

Four variables were collected for language background: students with documented ESL courses or TOEFL test scores, a completion of a basic writing, English 101, and English 102 courses. There were only 13 students (1.6%) with documented ESL grades or TOEFL tests in this population. There were only 30 students (3.6%) in this population who took a basic writing course. Two students with ESL background also had to take a basic writing course. All students completing the AS nursing program from SAU had to take English 101 (ENG 101) and English 102 (ENG 102). The grades for

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ENG 101 and ENG 102 ranged from .00 to 4.0 (*SD* = 1.04) and 1.30 to 4.0 (*SD* =59)

respectively. Table 6 presents the descriptive analysis comparison of NCLEX-RN

outcomes based on ENG 101 and 102 grades. Sixty-one students who transferred ENG

101 were given a credit (Pass), but no course grade was assigned in their transcript. The

missing grade was entered as .00 in the Excel file.

Table 6

Comparison of NCLEX-RN Outcomes by ENG 101 and ENGL 102

	Pass			Fail		
	n	*M*	*SD*	*n*	*M*	*SD*
ENG 101	772	3.23	1.07	66	3.18	0.64
ENG 102	769	3.50	0.58	65	3.32	0.60

Pre-requisite Courses

The nursing program required a minimum grade of "C" in all pre-requisite

courses: BIOL 101 (Anatomy and Physiology I), BIOL 102 (Anatomy and Physiology

II), BIOL 225 (Basic Microbiology), CHEM 111 (Survey Chemistry I), NRNT 125

(Nutrition), and PSYC 128 (Developmental Psychology). Seven students who completed

one of these courses elsewhere received a "Pass", and no other grade was assigned on

their transcript. The missing grade was entered as .00 in the Excel file. Two students had

a grade of C-, below the minimum requirement (see Table 7 for pre-requisite grade

distribution). Copies of paper transcripts were not available to verify the grades, and the

grades were kept as they were documented in the Student Information System. Both

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students who did not repeat the course, have since graduated and passed the NCLEX-RN on their first attempt. Table 8 presents the descriptive analysis comparison of NCLEX-RN outcomes based on pre-requisite course grades.

Table 7

Pre-requisite Course Grade Distribution

	n	Minimum	Maximum	*M*	*SD*
BIOL-101	836	0.00	4.00	3.06	0.66
BIOL-102	836	2.00	4.00	2.93	0.65
BIOL-225	837	1.70	4.00	3.12	0.66
CHEM-111	837	1.70	4.00	3.28	0.65
NRNT-125	838	2.00	4.00	3.37	0.52
PSYC-128	837	0.00	4.00	3.44	0.73

Core Nursing Courses

The grades for eight nursing courses, NRSG 106 (Fundamentals I), NRSG 107 (Fundamentals II), NRSG 126 (Adult Health I), NRSG 130 (Mental Health), NRSG 212 (Childbearing Family), NRSG 226 (Adult Health II), NRSG 231 (Child Health), and NRSG 305 (Adult Health III), for this population ($N = 838$) ranged from 2.3 (C+) to 4.0 (A). Table 9 presents the descriptive analysis comparison of NCLEX-RN outcomes (pass or failure) based on grades in core nursing courses.

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Table 8

Comparison of NCLEX-RN Outcomes by Pre-requisite Courses

	Pass			Fail		
	n	*M*	*SD*	*n*	*M*	*SD*
BIOL-101	770	3.09	0.66	66	2.70	0.58
BIOL-102	770	2.96	0.65	66	2.65	0.56
BIOL-225	771	3.15	0.66	66	2.81	0.58
CHEM-111	771	3.30	0.65	66	3.02	0.63
NRNT-125	772	3.40	0.51	66	3.04	0.50
PSYC-128	771	3.44	0.75	66	3.38	0.49

NCLEX-RN Preparation

The Health Education Systems, Incorporated (HESI) Exit Exam (E^2) score and the number of days in NCLEX-RN delay were entered as a part of predictive variables in this study. Students' HESI (E^2) score on first attempt ranged from 546 to 1240 with a mean of 891 (*SD* = 108). Students who passed the NCLEX-RN on first attempt had a higher mean score on the HESI (E2) (*M* = 899) than those who failed (*M* = 800). Approximately 81.6% of the population (*n* = 684) took NCLEX-RN within three months of graduation or transcript release. The number of days in test delay ranged from 10 to 695 (*M* = 72.46, *SD* = 53.31 days). See Table 10 for a complete comparison of NCLEX-RN outcomes based on the number of days in NCLEX-RN delay distribution.

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Table 9

Comparison of NCLEX-RN Outcomes by Core Nursing Courses Grade

	Pass					Fail
Course	*n*	*M*	*SD*	*n*	*M*	*SD*
NRSG-305	772	3.16	0.47	66	2.77	0.35
NRSG-231	772	3.62	0.37	66	3.32	0.34
NRSG-226	772	3.28	0.49	66	3.01	0.42
NRSG-212	772	3.42	0.42	66	3.03	0.32
NRSG-130	772	3.33	0.46	66	2.89	0.36
NRSG-126	772	3.45	0.43	66	3.04	0.32
NRSG-107	772	3.34	0.44	66	3.03	0.35
NRSG-106	772	3.41	0.43	66	3.08	0.40

Table 10

Comparison of NCLEX-RN Outcomes by NCLEX Delay Distribution

	Pass		Fail	
NCLEX-RN Delay Distribution	*n*	%	*n*	%
Less than or equal to 3 months (90 days)	647	83.8	37	56.1
3 to 6 months (91 to 180 days)	103	13.3	22	33.3
6 to 9 months (181 to 270 days)	14	1.8	4	6.1
More than 9 months (more than 270 days)	8	1.0	3	4.5

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Attempts to Complete Required Core Nursing Courses

In this study, successful completion of eight core nursing courses was needed for students to meet program requirements for graduation. The number of core nursing course completed, however, ranged from eight to twelve. The majority, 82.7% ($n = 693$) of the sample, those with a total of eight core nursing courses, successfully completed all required nursing courses on the first attempt. Approximately16.6% ($n = 139$) of the sample, those with a total of nine or ten documented core nursing courses in their student records had to repeat one or two nursing courses. The remainder of the population ($n = 6$), students with 11 or 12 core nursing courses were re-start candidates. Re-start candidates were dismissed from the program, usually after two course failures, but met the re-admission criteria (see Table 11 for a complete comparison of NCLEX-RN outcomes based on attempts to complete core nursing courses).

Table 11

Comparison of NCLEX-RN Outcomes by the Attempts to Complete Required Core Nursing Courses

Documented Core Courses	Pass		Fail	
	n	%	*n*	%
8	653	84.6	40	60.6
9	111	14.4	25	37.9
10	2	0.3	1	1.5
11	5	0.6		
12	1	0.1		

Note. Frequency of 8 never repeated a course; frequency of 9 repeated a course one time; frequency of 10 repeated a course two times; frequency of 11 or 12 re-start candidates.

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Research question one asked if non-academic variables contribute to successful NCLEX-RN outcomes. Demographic data (age, ethnicity, and gender), language background, and the number of attempts to complete core nursing courses were a part of non-academic variables. Logistic regression analysis and chi-square test for association were utilized to answer research question one.

Demographic Model

The SPSS included 820 (98%) cases in the analysis of the demographic model. The model was also statistically significant in distinguishing successful NCLEX-RN outcome, $\chi^2(5) = 25.68$, $p < .001$. The model explained 7.4% (NagelKerke R^2) of variance in NCLEX-RN results and correctly classified 92% of the variables. The sensitivity was 100%, which was the percentage of students that passed the exam and were also correctly predicted by the model to pass the exam. The model failed to predict failure. The Hosmer and Lemeshow test was non-significant ($p = .494$) indicating that the model fit the data well (see Table 12). The model indicated ethnicity and gender made a significant contributions to NCLEX-RN outcome. The Effect Size (NagelKerke R) for this analysis is medium according to Cohen's (1998) general classification (R = .30). However, statisticians advise against the uncritical use of Cohen's general classifications (see Grissom & Kim, 2012, p. 131). Instead, Hill, Bloom, Black, and Lipsey (2008) suggest three empirical benchmark for interpreting practical significance of ESs. In this study, I interpret practical significance of results by using the odds ratios and comparison of results between subgroups of students as suggested by Hill et al.. In reference to

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Caucasians, all three minority groups did poorly on the NCLEX-RN. The odds ratios for

Hispanics, Asians, and Blacks were 3.3, 2.6, and 4.5 respectively. These odds ratios

indicate a substantive negative impact on minority students' NCLEX-RN success. The

odds ratio for gender indicated that when holding all other variables constant, men were

two times less likely than women to pass the exam. The ES from this analysis indicated a

substantive negative impact on male students in the program. Age did not play a role in

the demographic model.

Table 12

Logistic Regression: Demographic Model

	Demographic		
Variable	B	Wald χ^2	Exp(B)
Gender (Male)	-0.67	5.20*	0.51
Ethnicity(1)	-1.22	12.78***	0.30
Ethnicity(2)	-0.96	5.86*	0.38
Ethnicity(3)	-1.54	15.10***	0.22
Admitted Age	0.04	0.36*	1.04
-2 log likelihood	413.704		
R^2	.074		
χ^2	25.675		
df	5		
p	< .001		

*p < .05, **p < .01, ***p < .001

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ESL/Language Background

There were 13 (1.6%) and 30 (3.6%) students with ESL background and basic writing respectively within the study population ($N = 838$). Of the 66 students who failed the NCLEX-RN, only one had to take ESL/EESL (English Language Skills) courses. A chi-square test for association revealed no significant association between ESL and NCLEX-RN, $\chi^2 (1) = .001$, $p = .980$. The result was confirmed by a Fisher's exact test ($p = 1.00$). The Effect Size, phi = .001, for this study analysis is extremely small and no practical significance was observed.

A chi-square test for association was also conducted between basic writing and NCLEX-RN results. The test confirmed a significant association between basic writing and NCLEX-RN $\chi^2 (1) = 6.30$, $p = .012$. The result was confirmed by a Fisher's exact test ($p = .025$). A total of 772 (92.1%) students of the total study population ($N = 838$) passed the NCLEX-RN on their first attempt. Of the 772 students, 24 (3.1%) took a basic writing course and 748 (96.9%) did not. Students who did not have to take a basic writing course performed better on the NCLEX-RN. Having to take a basic writing, however, did not automatically place a student at higher risk for NCLEX-RN failure. Further evaluation of the population ($n = 30$) who took a basic writing course revealed that 80% ($n = 24$) passed the NCLEX-RN on their first attempt and only 20% of them ($n = 6$) failed the exam. Although the finding was significant, the Effect Size, phi = .087, for this analysis is small and no practical significance was observed.

English 101 and English 102 were included in a trial logistic regression full model. However, due to their non-significant contribution, both were subsequently

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removed from the model. The *p* values for ENG 101 and ENG 102 were .860 and .946 respectively.

Attempts to Complete Required Core Nursing Courses

A chi-square test confirmed a significant association between the number of attempts to complete required core nursing courses and successful NCLEX-RN outcome, $\chi^2(1) = 24.433$, $p = .000$. Approximately 92.1% of the total population in this study ($N = 838$) passed the NCLEX-RN on their first attempt. Approximately 84.6% ($n = 653$) of the sample graduated from the program without having to repeat any core nursing courses (students with eight documented core nursing courses), passed the NCLEX-RN on their first attempt (see Table13). However, having to repeat a course more than once might not necessarily jeopardize a student's ability to pass the NCLEX-RN, although first attempt pass rates decline with the number of course repeats. Further evaluation indicated that 81.6% of 136 students who had at least one course repeat passed the NCLEX-RN on first attempt. This result is 3% below the state minimum required first time pass rate of 85%. Two of three students with two course repeats also passed the NCLEX-RN on their first attempt. In addition, 100% of six re-start candidates, those who had more than two failures but met the readmission criteria, passed the NCLEX-RN on first attempt (see Table 14). The finding for attempts to complete required core nursing course variable was significant. Although the Effect Size, phi = .17, for this analysis is small according to Cohen's (1998) general classification, students who repeated a single core course had a pass rate approximately 10% lower than students who did not repeat any core courses. The first attempt pass rate declined further for each additional nursing course repeat.

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Table 13

Cross-tabulation: Attempts to Complete Required Core Nursing Courses and NCLEX-RN

| | % Within NCLEX-RN Result | | | |
| | Pass | | | Fail |
Frequency	*n*	%	*n*	%
0	653	84.6	40	60.6
1 or more	119	15.4	26	39.4

Note. Frequency of 0 never repeated a course.

Table 14

Cross-tabulation: Students with Higher Number of Attempts to Complete Required Core Nursing Courses

| | % Within NCLEX-RN Result | | | |
| | Pass | | | Fail |
Frequency	*n*	%	*n*	%
0	653	94.2	40	5.8
1	111	81.6	25	18.4
2	2	66.7	1	33.3
3	5	100	0	0.0
4	1	100	0	0.0

Note. Frequency of 0 never repeated a course; frequency of 3 or 4 re-start candidates.

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Research Question 2

Research question two asked which pre-nursing admission variables contribute to successful NCLEX-RN outcomes. There were two sets of predictor variables. The first set of pre-nursing admission academic variables were comprised of ACT English, ACT reading, ACT math, and the admission cumulative GPA calculated the semester prior to NRSG 106 (Fundamentals I) enrollment. The second set of variables included six pre-requisite courses: BIOL 101 (Anatomy and Physiology I), BIOL 102 (Anatomy and Physiology II), CHEM 111 (Survey of Chemistry I), NRNT 125 (Nutrition), PSCY 128 (Developmental Psychology), and BIOL 225 (Basic Microbiology).

Pre-nursing Admission Test Score Model

This model did not include cumulative ACT scores to prevent collinearity issues (Osborne, 2015) with subject-specific ACT scores. Only 680 cases were included in this analysis, but the model met the minimum sample requirement to achieve a power of 0.8 and a medium effect size (Hsieh et al., 1998; Osborne). The model was statistically significant, χ^2 (4) = 53.712, $p < .001$. The model explained 18% (NagelKerke R^2) of variance in NCLEX-RN results and correctly classified 92% of the variables. The sensitivity was 100%, which was the percentage of students that passed the exam and were also correctly predicted by the model to pass the exam. Predictive values were 93% and 0% for the positive and negative respectively. This model alone was not able to predict failure. The Hosmer and Lemeshow test ($p = .715$) affirmed that the model fit the data well. The NagelKerke ($R = .42$) for this analysis indicates a large ES according to the Cohen's (1998) general classification. However, based on the odds ratios, the

practical significance of ACT reading is negligible while the impact of cumulative GPA

is substantive as students with high GPAs are 4.5 times more likely to achieve NCLEX-

RN success. Table 15 shows ACT reading ($M = 24.41$, $SD = 5.08$, $p = < .001$, $OR = 1.2$)

and admission cumulative GPA ($M = 3.37$, $SD = 0.33$, $p = < .01$, $OR = 4.5$) as significant.

Table 15

Logistic Regression: Pre-nursing Admission Test Score Model

Variable	Pre-nursing Admission Test Score		
	B	Wald χ^2	Exp(B)
ACT English	0.00	0.00	1.00
ACT Math	-0.03	0.29	0.97
ACT Reading	0.17	12.56***	1.19
Admission GPA	1.51	6.02**	4.52
-2 log likelihood	318.53		
R^2	.18		
χ^2	53.71		
df	4		
p	$< .001$		

*$p < .05$, **$p < .01$, ***$p < .001$

Pre-requisite Course Model

A total of 831 (99%) out of 838 cases were included in this analysis which met

the minimum sample requirement to achieve a power of 0.8 and a medium effect size.

The model was statistically significant, χ^2 (6) $= 36.33$, $p < .001$. The model explained

10% (NagelKerke R^2) of variance in NCLEX-RN outcomes and correctly classified 92%

of the variance. The sensitivity was 100%, which was the percentage of students that

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passed the exam and were also correctly predicted by the model to pass the exam. This model alone was not able to predict failure. Positive predictive value was 92% and negative predictive value was 0%. The Hosmer and Lemeshow test was not significant (p = .41) suggesting that there was a linear relationship between the predictor variables and the dependent variable. NRNT 125 (Nutrition) (M = 3.37, SD = .518, p = < .001, OR = 2.3) was the only significant predictor in this model (as shown in Table 16). The Effect Size (NagelKerke R = .32) for this analysis is medium according to Cohen's (1998) general classification. In this model, the practical significance of students who performed well in nutrition class is substantive, as they are more than twice as likely to have a successful NCLEX-RN outcome.

Table 16

Logistic Regression: Pre-requisite Course Model

	Pre-requisite Course		
Variable	B	Wald χ^2	Exp(B)
BIOL101	0.47	3.39	1.61
BIOL102	-0.05	0.03	0.95
CHEM111EQ	0.19	0.77	1.22
NRNT125EQ	0.83	7.73**	2.28
PSYC128EQ	-0.15	0.35	0.87
BIOL225EQ	0.37	2.62	1.45
-2 log likelihood	424.642		
R^2	.10		
χ^2	36.33		
df	6		
p	<.001		

*p < .05, **p < .01, ***p < .001

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Research question three asked which nursing variables contribute to successful NCLEX-RN outcomes. There were two sets of predictor variables. The first set was comprised of the following eight core nursing courses: NRSG 305 (Adult Health III), NRSG 231 (Child Health), NRSG 226 (Adult Health II), NRSG 212 (Childbearing Family), NRSG 130 (Mental Health), NRSG 126 (Adult Health I), NRSG 107 (Fundamentals I), and NRSG 106 (Fundamentals II); and, the second set was comprised of NCLEX-RN preparation variables. The NCLEX-RN variables included HESI (E^2) and the number of days in NCLEX-RN delay.

Nursing Course Model

Since there were no missing data, the SPSS included all population ($N = 838$) in its analysis. The sample population met the minimum sample requirement to achieve a power of 0.8 and a medium effect size. The model was statistically significant in distinguishing successful NCLEX-RN outcome, χ^2 (8) = 94.261, $p < .001$. The model explained 25% (NagelKerke R^2) of variance in NCLEX-RN results and correctly classified 92% of the variance. The sensitivity was 100%, which was the percentage of students that passed the exam and were also correctly predicted by the model to pass the exam. The specificity was 3%, which indicated the percentage of students who failed the NCLEX-RN and were also correctly predicted by the model to fail the exam. Positive predictive value was 94% and negative predictive value was 50%, the highest of all models. The Hosmer and Lemeshow test was non-significant ($p = .264$) indicating that the model fit the data well (see Table 17).

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This model indicated five out of eight nursing courses as significant. The students with higher grades in NRSG 305 ($M = 3.13$, $SD = 0.47$, $p = < .05$, $OR = 3.0$), NRSG 212 ($M = 3.39$, $SD = 0.42$, $p = < .05$, $OR = 2.9$), NRSG 130 ($M = 3.29$, $SD = 0.46$, $p = < .01$, $OR = 3.0$), NRSG 126 ($M = 3.41$, $SD = 0.44$, $p = < .05$, OR = 2.8), and NRSG 106 ($M = 3.38$, $SD = 0.44$, $p = < .05$, $OR = 2.1$) were more likely to be successful in passing the NCLEX-RN. The Effect Size (NagelKerke R = .50) for this analysis is large according to Cohen's (1998) general classification. Predictors in this model showed practical significance, as students who performed well in Adult Health III, Childbearing Family, Mental Health, Adult Health I, and Fundamentals I were two to three times more likely to have positive NCLEX-RN outcomes.

NCLEX-RN Preparation Model

All Data ($N = 838$) were included in the analysis of NCLEX-RN preparation. This model containing HESI (E^2) and NCLEX-RN delay met the minimum sample requirement to achieve a power of 0.8 and a medium effect size. The model was significant, $\chi^2 (4) = 63.17$, $p < .001$. The model explained 17% (NagelKerke R^2) of the variance in the NCLEX-RN outcomes and correctly classified 92% of the variables. The sensitivity was 100%, suggesting that the model also correctly predicted the percentage of students who passed the exam. The specificity was 3% indicating that the model also correctly predicted the percentage of students who failed the exam. Positive predictive value was 92% and negative predictive value was 50%. The Hosmer and Lemeshow test was non-significant ($p = .663$) indicating that the model fit the data well.

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Table 17

Logistic Regression: Nursing Course Model

| Variable | Nursing Course | | |
	B	Wald χ^2	Exp(B)
NRSG305	1.08	6.21*	2.96
NRSG231	0.06	0.02	1.06
NRSG226	-0.43	1.50	0.65
NRSG212	1.06	4.81*	2.90
NRSG130	1.11	8.41**	3.02
NRSG126	1.04	5.59*	2.84
NRSG107	-0.19	0.20	0.83
NRSG106	0.75	3.96*	2.12
-2 log likelihood	367.86		
R^2	.25		
χ^2	94.26		
df	8		
p	<.001		

*p < .05, **p < .01, ***p < .001

The Effect Size (NagelKerke R) for this analysis is approximately medium according to Cohen's (1998) general classification (R = .41). However, since the odds ratios in analysis of this model were equal to one, there is no practical significance of these predictor variables. The individual model of NCLEX-RN preparation projected that students with higher HESI (E^2) scores ($M = 891.31$, $SD = 108.42$, $p = < .001$, $OR = 1.0$)

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did not increase their probability of passing NCLEX-RN, and students who delayed in taking the NCLEX-RN ($M = 72.46$, $SD = 53.31$ days, $p = < .01$, $OR = 1.0$) did not decrease their probability of passing the NCLEX-RN (see Table 18).

Table 18

Logistic Regression: NCLEX-RN Preparation Model

	NCLEX-RN Preparation		
Variable	*B*	Wald χ^2	Exp(*B*)
HESI (E^2)	.01	38.96***	1.01
NCLEX-RN Delay	-.01	9.49**	1.00
-2 log likelihood	398.94		
R^2	.17		
χ^2	63.17		
df	2		
p	< .001		

*p < .05, **p < .01, ***p < .001

Research Question 4

Research question four asked which set of variables, from all models generated, contribute to successful NCLEX-RN outcomes.

Hierarchical Model

A logistic regression model based on demographic data of the population and nursing program's requirements was run to answer the research question. The dependent

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variable was NCLEX-RN outcomes (pass or fail). A total of 25 predictor variables were added into the equation using a hierarchical entry to represent SAU nursing program's unique admission, progression, and graduation sequence.

The demographic data (gender, ethnicity, and age) were entered first into the equation, followed by academic test scores (ACT English, ACT math, ACT reading, and admission cumulative GPA), and pre-requisite course grades (BIOL 101, BIOL 102, CHEM 111, NRNT 125, PSCY 128, and BIOL 225). Core nursing courses (NRSG 305, NRSG 231, NRSG 226, NRSG 212, NRSG 130, NRSG 126, NRSG 107, and NRSG 106) were entered after pre-requisite courses, and followed by NCLEX-RN preparation (HESI (E^2) score and the number of days in NCLEX-RN delay) last.

Due to the nature of the logistic regression, any student record with missing data was eliminated by the SPSS. The number of the study population after listwise deletion ($n = 657$) was more than double the minimum sample requirement to achieve a power of 0.8 and a medium effect size (Hsieh et al., 1998; Osborne, 2015). The regression equation model showed the following values: Log odds = -13.151 + -.199(Male) + -1.496(Hispanic) + .759(Asian/Pacific Islander) + -1.152(Black, not Hispanic origin) + .025(Admit Age) + -.043(ACT English) + -.055 (ACT Math) + .198(ACT Read) + -1.939(Admit Cum. GPA) + .607(BIOL 101) + -.3018(BIOL 102) + .212(CHEM 111) + .525(NRNT 125) + -0319(PSYC128) + .156(BIOL 225) + 1.413(NRSG 305) + .447(NRSG 231) + -.607(NRSG 226) + .803(NRSG 212) + 1.617(NRSG 130) + 1.156(NRSG 126) + -.227(NRSG 107) + .139(NRSG 106) + .004(HESI E^2) + -.001(NCLEX-RN Delay). The logistic regression model was statistically significant in distinguishing successful NCLEX-RN outcome, $\chi^2 (25) = 121.214$, $p < .001$. The -2 log

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likelihood was 227.431 when all 25 variables were added into the model (Block 4). The model explained 41% (NagelKerke R^2) of variance in NCLEX-RN results and correctly classified 93.6% of the variables. The sensitivity was 98.8%, which was the percentage of students that passed the exam and were also correctly predicted by the model to pass the exam. The specificity was 28.6%, which was the percentage of students who failed the NCLEX-RN and were also correctly predicted by the model to fail the exam. The positive predictive value was 95% and the negative predictive value was 33%. The Hosmer and Lemeshow goodness of fit test was non-significant ($p = .543$) indicating that the model fit the data well.

Of the 25 predictor variables only ethnicity, ACT reading, NRSG 305, NRSG 130, and NRSG 126 were statistically significant. The Effect Size (NagelKerke $R = .64$) for this analysis is large according to Cohen's (1998) general classification. Its magnitude of importance is large because the odds ratio for ethnicity, when holding all other variables constant, indicated a Hispanic student was five times less likely than a Caucasian student to pass the NCLEX-RN; a Black student, in reference to a Caucasian, was three times less likely to succeed on the NCLEX-RN. The Wald criterion demonstrated that students with higher ACT reading ($M = 24.41$, $SD = 5.08$, $p = < .001$, $OR = 1.2$), higher grades in NRSG 305 ($M = 3.13$, $SD = 0.47$, $p = < .05$, $OR = 4.1$), NRSG 130 ($M = 3.29$, $SD = 0.46$, $p = < .01$, $OR = 5$), and NRSG 126 ($M = 3.41$, $SD = 0.44$, $p = < .05$, $OR = 3.2$) made a significant contribution to the prediction of successful NCLEX-RN outcome.

Overall, this was a good model as shown by a reduction in the -2 log likelihood from 348.645 in the initial independence model to 227.43 in the final model.

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Independence model is a model without any predictor variables added into the equation (Osborne, 2015). See Table 19 for full details on this model.

Restricted Model

A Restricted model using predictor variables that were statistically significant was also performed to compare the R^2 between the Hierarchical model and the Restricted model. The Restricted model was also statistically significant in distinguishing successful NCLEX-RN outcomes, χ^2 (7) = 104.206, $p < .001$. The regression equation model showed the following values: Log odds = -13.981 + -1.316(Hispanic) + -1.047(Black, not Hispanic origin) + .179(ACT Read) + 1.430(NRSG 305) + 1.564(NRSG 130) + 1.186(NRSG 126). The -2 log likelihood of the independence model dropped from 349.571 to 245.365 in the next model, indicating a good overall model fit.

The Restricted model explained 36% (NagelKerke R^2) of variance in NCLEX-RN outcome and correctly classified 93.4% of the variables, 5% less than the full Hierarchical model. The sensitivity of restricted model was 99.3%, which was the percentage of students that passed the exam and were also correctly predicted by the model to pass the exam. The specificity was 18.4%, which indicated the percentage of students who failed the NCLEX-RN and were also correctly predicted by the model to fail the exam. Positive predictive value was 94% and negative predictive value was 31%. The Hosmer and Lemeshow test was non-significant ($p = .992$) indicating that the model fit the data well. All predictor variables in this restricted model were statistically significant. The Effect Size (NagelKerke R = .60) for this analysis is large according to Cohen's (1998) general classification. Its magnitude of importance is also large as the

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odds ratio for ethnicity indicates a strong negative influence in the NCLEX-RN outcomes for minority students. In this model, a Hispanic student was four times less likely than a Caucasian student (the reference group) to pass the NCLEX-RN. Similarly, a Black student, in reference to a Caucasian, was three times less likely to succeed on the NCLEX-RN. The Wald criterion in the Restricted model remained very similar with the Hierarchical model. The following variables were statistically significant of the NCLEX-RN success: ACT reading ($M = 24.41$, $SD = 5.08$, $p = < .001$, $OR = 1.2$), higher grades in NRSG 305 ($M = 3.13$, $SD = 0.47$, $p = < .05$, $OR = 4.2$), NRSG 130 ($M = 3.29$, $SD = 0.46$, $p = < .01$, $OR = 4.8$), and NRSG126 ($M = 3.41$, $SD = 0.44$, $p = < .05$, $OR = 3.3$). Students with higher grades in Adult Health III, Mental Health, and Adult Health I were three to five times more likely to have a positive NCLEX-RN outcome (see Table 20). However, since the odds ratio for ACT reading was only 1.2, this variable did not make a practical contribution to NCLEX-RN success in this study population.

Table 19

Logistic Regression: Hierarchical Model

Variable		Model 1			Model 2	
	B	Wald χ^2	Exp(B)	B	Wald χ^2	Exp(B)
Gender (M)	-0.51	1.96	0.60	-0.63	2.72	0.53
Hispanic	-1.12	7.52**	0.33	-1.19	8.12**	0.31
Asian/Pacific Islander	0.18	0.09	1.20	0.24	0.15	1.27
Black, not Hispanic origin	-1.33	8.19**	0.27	-1.30	7.31**	0.27
Admitted age	0.10	1.12	1.10	0.09	0.76	1.09
ACT English	0.00	0.00	1.00	-0.01	0.01	0.99
ACT Math	-0.04	0.35	0.97	-0.04	0.51	0.96
ACT Reading	0.17	12.75***	1.19	0.18	13.27***	1.20
Admitted Cumulative GPA	1.52	6.10*	4.57	0.29	0.08	1.33
BIOL 101				0.34	1.06	1.40
BIOL 102				0.08	0.05	1.08
CHEM 111				0.16	0.28	1.18
NRNT 125				0.53	1.69	1.70
PSYC 128				-0.35	0.84	0.70
BIOL 225				0.16	0.31	1.18
NRSG 305						
NRSG 231						
NRSG 226						
NRSG 212						
NRSG 130						
NRSG 126						
NRSG 107						
NRSG 106						
HESI (E^2)						
NCLEX-RN Delay						
-2 log likelihood	287.67			283.13		
R^2	.22			.23		
χ^2	60.98			65.52		
df	9			15		
p	< .001			< .001		

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Table 19—*Continued*.

Variable	B	Model 3 Wald χ^2	Exp(B)	B	Model 4 Wald χ^2	Exp(B)
Gender (M)	-0.23	0.25	0.79	-0.20	0.18	0.82
Hispanic	-1.57	11.28**	0.21	-1.50	9.94**	0.22
Asian/Pacific Islander	0.47	0.49	1.60	0.76	1.15	2.14
Black, not Hispanic origin	-1.20	4.41*	0.30	-1.15	4.02*	0.32
Admitted age	0.04	0.10	1.04	0.03	0.05	1.03
ACT English	-0.04	0.28	0.97	-0.04	0.36	0.96
ACT Math	-0.04	0.30	0.96	-0.06	0.65	0.95
ACT Reading	0.21	14.86***	1.24	0.20	12.58***	1.22
Admitted Cumulative GPA	-2.01	2.49	0.13	-1.94	2.27	0.14
BIOL 101	0.60	3.00	1.82	0.61	2.95	1.84
BIOL 102	-0.30	0.59	0.74	-0.32	0.66	0.73
CHEM 111	0.22	0.43	1.24	0.21	0.39	1.24
NRNT 125	0.52	1.35	1.68	0.53	1.36	1.69
PSYC 128	-0.30	0.50	0.74	-0.32	0.58	0.73
BIOL 225	-0.16	0.21	0.86	-0.16	0.21	0.86
NRSG 305	1.66	8.21**	5.25	1.41	5.71*	4.11
NRSG 231	0.51	0.63	1.66	0.48	0.51	1.61
NRSG 226	-0.64	2.17	0.53	-0.61	1.97	0.55
NRSG 212	0.79	1.63	2.21	0.80	1.66	2.23
NRSG 130	1.55	9.02**	4.72	1.62	9.50**	5.04
NRSG 126	1.20	4.16*	3.31	1.16	3.76*	3.18
NRSG 107	-0.05	0.01	0.95	-0.23	0.15	0.80
NRSG 106	0.29	0.29	1.34	0.14	0.06	1.15
HESI (E^2)				0.00	2.65	1.00
NCLEX-RN Delay				0.00	0.26	1.00
-2 log likelihood	230.68			227.43		
R^2	.40			.41		
χ^2	117.96			121.21		
df	23			25		
p	$< .001$			$< .001$		

*$p < .05$, **$p < .01$, ***$p < .001$

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Table 20

Logistic Regression: Restricted Model

	Restricted Model		
Variable	B	Wald χ^2	Exp(B)
Hispanic	-1.32	9.86**	0.27
Asian/Pacific Islander	0.48	0.56	1.62
Black, not Hispanic origin	-1.05	4.58*	0.35
ACT Reading	0.18	16.87***	1.20
NRSG 305	1.43	8.85**	4.18
NRSG 130	1.56	11.99**	4.78
NRSG 126	1.19	5.42*	3.27
-2 log likelihood	245.37		
R^2	.36		
χ^2	104.21		
df	7		
p	< .001		

*p < .05, **p < .01, ***p < .001

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Summary of Major Findings

Several variables were significant in predicting successful NCLEX-RN outcome for this study population. There are several anticipated and surprising major findings resulted from this study.

Of three demographic data collected, ethnicity was a consistent variable in predicting NCLEX-RN outcomes (see Tables 12, 19, and 20). Gender was significant in the Demographic model but not in the Hierarchical model when all variables were added into the equation. ACT reading score made a statistically significant contribution in prediction of NCLEX-RN success in all models (see Table 15, 19, and 20). However, since the odds ratio for ACT reading was only 1.2, it had no practical value as a predictor of NCLEX-RN outcomes in any of these models. While ACT reading was significant, ESL or language background did not play a role in NCLEX-RN outcomes in this study population. Admission cumulative GPA was a significant predictor in the Pre-nursing Admission Test Score model (see Table 15) but not in the Hierarchical model when the rest of the academic variables were entered into the equation (see Table 19). Nutrition was the only strong predictor in the Pre-requisite model. Other science courses such Chemistry or Biology did not contribute to NCLEX-RN success in any models. Students' performance in NRSG 305 (Adult Health III), NRSG 130 (Mental Health), and NRSG 126 (Adult Health I), three of the eight core nursing courses, designed to prepare students for safe and competent practice were also consistently significant in all models (see Table 17, 19, and 20). Hispanic and Black students, in reference to Caucasian students, experienced substantive negative impact on NCLEX-RN success. Odds ratios indicated

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that a Hispanic and a Black student were four and three times, respectively, less likely to pass the NCLEX-RN.

It was unexpected to see non-significant contribution of HESI (E^2) score ($p = .104$) and NCLEX-RN delay ($p = .61$) in the full Hierarchical model (see Table 19). Another surprising results was the successful NCLEX-RN outcome among graduates who had to repeat core nursing classes (see Table 13 and 14). The R^2, explained variance, between Hierarchical and Restricted model was different. The R^2 for Restricted model (see Table 20) was 5% less than the full Hierarchical model. Further discussion, conclusion, implications, and recommendations of the results will be included in the following chapter.

CHAPTER V

SUMMARY, DISCUSSION, AND RECOMMENDATION

Introduction

Nurses play a vital role in maintaining safety and delivering high quality patient care in the United States. According to the Bureau of Labor Statistics (2014a), nursing professions will remain in high demand for the next several decades. Despite a recent growth of supply for registered nurses (RNs) (Health Resources and Services Administration, 2014), this country is still facing a nursing shortage (e.g.: Buerhaus et al., 2009; Health Resources and Services, 2014). Factors such as an aging nursing workforce (Health Resources and Services Administration, 2013), nursing faculty shortage, and limited hospital or clinical practice sites (Rosseter, 2012; Kaufman, 2013) were cited as main causes for short supply of a much needed profession.

A drop in the national pass rate among first-time U.S. educated nursing graduates was noted with recent changes in the examination passing standards. The most recent changes in the passing standard took place on April 1, 2013, and will remain in effect until March 31, 2016 (National Council of State Boards of Nursing, 2013h). Following the change in passing standard, the national NCLEX-RN pass rate for U.S. educated first-time test takers dropped from 90% ($N = 137,690$) in 2012 to 83% ($N = 155,098$) in 2013, a drop of 7% (National Council of State Boards of Nursing, 2013g). Inevitably, this low pass rate, causes fewer new graduates entering the nursing workforce in this country.

The NCLEX-RN pass rate among Southern Adventist University (SAU) associate of science (AS) nursing graduates began to decline in 2011. The pass rate dropped from 94.9% in 2010 to 88.8% in 2011. The pass rate went up to 93.3% in 2012, but dropped again by almost 5% in the following year, and to an all-time low of 76.5% in 2014.

Unlike most AS nursing program student populations, the majority of SAU students are young and considered traditional-age college students. A greater understanding of nursing student characteristics that potentially influences NCLEX-RN outcomes for this unique population of traditional undergraduates could result in the attraction of younger students into the nursing profession and ultimately entering the nursing workforce. No specific and current peer-reviewed studies were found in the Review of Literature that correlate associate degree nursing program criteria among traditional-age college students, such as those at Southern Adventist University.

Purpose of the Study

The purpose of this study was to identify academic and non-academic variables that predict successful NCLEX-RN outcome among a sample of a traditional student population who completed the associate of science degree at Southern Adventist University. Four research questions that guided this study are as follows:

1. Do non-academic variables contribute to successful NCLEX-RN outcomes?

2. Which pre-nursing admission variables contribute to successful NCLEX-RN outcomes?

3. Which nursing program variables contribute to successful NCLEX-RN outcomes?

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4. Which set of variables, from all models generated, contribute to successful NCLEX-RN outcomes?

Conceptual Framework

Two theoretical frameworks underpinning this study are Astin's Student Involvement theory (1999) and Astin's Input-Environment-Outcome (1997). According to Astin (1999), student involvement constitutes "the amount of physical and psychological energy that the student devotes to the academic experience" (p. 518). The extent of one's involvement (combination of qualitative and quantitative efforts), however, is not static and is often influenced by pre-set values established by a learner. For example, a student who perceives learning as valuable is more likely to take a concerted effort to study than a student who is not.

According to Astin (1997), the Input-Environment-Outcome (I-E-O) model is a measurement of academic growth. Students with stronger input (academic) characteristics at the time of admission are presumed to perform better academically. However, factors such as academic policies, peer group, and faculty members play a role in a student's growth (outcome) within an academic environment (Astin, 1997).

Since there is no "one" perfect learning approach, educators and students are accountable for their actions in the terms of achieving mutual learning outcomes. The Student Involvement theory and the Input-Environment-Outcome model serve as a conceptual substitute that allow flexibility for nursing faculty to adopt various pedagogical approaches that can encourage students' involvement and ultimately reach the desired learning outcome.

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Overview of the Literature

Researchers commonly utilize various academic and non-academic criteria to predict NCLEX-RN outcomes. Evaluation of students performance using academic criteria is a standard practice to measure potential academic growth (Astin 1997, 1999). The admission selection process operates under the premise that students with higher test scores or grades perform better in nursing school and ultimately are more likely to pass the NCLEX-RN on first attempt.

Grossbach and Kunchel (2011), for example, concluded that the ACT composite score ($r = .42$, $n = 1572$) and SAT composite score ($r = .46$, $n = 991$) were a better predictor of NCLEX-RN than pre-nursing GPA. On the other hand, Romeo (2013) noted that nursing GPA ($M = 3.08$) ($p < .001$) was a more significant predictor of NCLEX-RN success than a combination of SAT math and verbal scores. Similarly, the study by Yin and Burger (2003) reported students admitted with high pre-nursing GPA ($M = 3.20$) performed better on NCLEX-RN. Haas et al. (2003) found the cumulative nursing GPA ($M = 3.3$) as the only predictor of NCLEX-RN success. A study by Trofino (2013) did not find significant findings between any standardized pre-admission exams (ACT, SAT, Test of Essential Academic Skills), high school GPA, grades in pre-requisite courses and successful NCLEX-RN outcome. This study also explored the correlation between repetition of a course and NCLEX-RN and found a student who never repeated a didactic nursing course was almost four times more likely to pass the licensure examination (Trofino, 2013). A study by Seldomridge and DiBartolo (2004) also did not find correlation between grades in Chemistry, Anatomy and Physiology, or Statistics courses and NCLEX-RN outcome.

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Beeman and Waterhouse (2001) discovered a grade of C+ or lower earned in didactic nursing courses was the most significant factor in predicting NCLEX-RN failure in their population sample. Students who passed NCLEX-RN had higher GPAs and nursing course grades. Age, gender, and SAT verbal variables were not predictive of NCLEX-RN in this study. A follow-up study on post-graduation factors and NCLEX-RN by Beeman and Waterhouse (2003) found the number of hours spent in NCLEX-RN preparation ($M = 66$) ($rho = .648$, $p \leq .022$) and the number of hours spent in studying the week prior of taking the examination ($M = 11.8$) ($rho = .585$, $p \leq .045$) were significantly correlated with successful NCLEX-RN outcome. No other variables (including demographic data, amount of exercise, amount of sleep, experiencing major life events, experiencing ongoing stress, the number of weeks in the NCLEX-RN delay period, the number of hours worked, or having taken a review course) correlated with NCLEX-RN success. On the contrary, Silvestri et al. (2013) found that emotional or personal stressors contributed toward failure of the NCLEX-RN.

A study by Beeson and Kissling (2001) discovered that students with more Cs, Ds, and Fs through their junior level performed poorly on NCLEX-RN ($p < .001$). Students who passed the NCLEX-RN on first attempt had a higher GPA in all cognates courses ($M = 3.37$, $SD = .50$), a higher GPA in all nursing courses ($M = 3.44$, $SD = .37$), and a higher score on Mosby Asses test ($M = 222.7$, $SD = 36.8$).

Discrepancies between the correlation of specific nursing courses and successful NCLX-RN were found in the literature. A study by Landry et al. (2010), for example, found moderate correlation between the grade in Psychiatric/Mental Health Nursing course and NCLEX-RN success in a sample of university-based pre-licensure students

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completing their bachelor's degree in nursing. The same study, however, did not find correlation between a grade in Psychiatric/Mental Health Nursing course and NCLEX-RN success in a sample of master's degree entry students completing their pre-licensure requirement from the same university.

The majority of studies (e.g.: Penprase et al., 2013; Seldomridge & DiBartolo, 2004; Silvestri et al., 2013; Trofino, 2013) demonstrated high correlation between Medical-Surgical related content NCLEX-RN success. Trofino (2013), for example, found correlation between grades in an Advanced Medical-Surgical course and successful NCLEX-RN. Penprase et al. (2013) identified grades in Introductory Medical Surgical course as a predictor of NCLEX-RN success and an indicator of students who may need additional interventions academically. Correlation of Medical-Surgical related content and NCLEX-RN success was corroborated by the National Council of State Boards of Nursing (National Council of State Boards of Nursing, 2012).

Nursing programs often utilize a standardized exit exam score to assess students' readiness for the NCLEX-RN and to plan for remediation steps to improve pass rates. A study by Morrison et al. (2008), for example, affirmed positive impact of remediation activities on NCLEX-RN among students at-risk of failing the NCLEX-RN. The accuracy of the HESI Exit Exam (E^2) in predicting successful NCLEX-RN outcome was supported by various studies (e.g.: Harding, 2010; Yoho et al., 2007; Young & Wilson, 2013). In contrast, Spurlock and Hunt (2008) argued that HESI (E^2) was not a strong predictor of NCLEX-RN failure; and, nursing programs should not rely on one single exit score to predict students' readiness for the NCLEX-RN outcome.

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Gilmore (2008) explored correlation between pre nursing admission criteria and academic success. Gilmore asserted that a student's proficiency in language and reading comprehension, as shown in this study by the predictive ability of the ACT English and ACT reading scores, was critical for development of critical-thinking skills, successful performance in a nursing program, and on the NCLEX-RN. Mastery of the English language was often cited as a factor that may put a student who does not speak English as their native language at home at risk for completing the nursing program and failing the NCLEX-RN (Bosher & Bowles, 2008; Caputi & Engelmann, 2008; Cunningham et al., 2004; Hansen & Beaver, 2012; Silvestri et al., 2013). In contrast, Uyehara et al. (2007) did not find correlation between ESL background and NCLEX-RN outcome. However, there were inconsistencies in the literature regarding the correlation of English grades and/or scores on standardized exams that focused on English reading or English comprehension and NCLEX-RN success (Higgins, 2005; Yin & Burger, 2003). While a student preparing to take the NCLEX-RN is expected to meet the minimum comprehension of English language, a student's outcome on the exam is not determined by his or her reading ability (O'Neill, 2004). In addition, the NCLEX-RN is a test of a candidate's basic nursing knowledge. Each examination question has gone through rigorous language and readability analysis to avoid examination bias (Woo & Dragan, 2012).

Several studies have evaluated potential correlation between specific demographic data such as age, gender, and ethnicity and NCLEX-RN outcome. The upper age varied from study to study. According to Trofino (2013), older students did better on the licensure examination ($M = 24.79$). Haas et al. (2003) claimed that younger students

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performed better; however, the average age in this study population was 26.52 years. Beeson and Kissling (2001) found older students ($M = 26.4$) performed better on the NCLEX-RN than younger students ($M = 24.5$). A study by Beeman & Waterhouse (2001), however, did not find correlation between age and NCLEX-RN outcome. Higgins (2005) did not find correlation between age, gender, and ethnicity and NCLEX-RN. On the contrary, Haas et al. (2003) found that men did not do as well as women on the NCLEX-RN; and, African American and Asian students failed at a higher rate than Caucasian students.

A study by Woo et al. (2009) found a strong inverse correlation between a delay in taking the NCLEX-RN and examination results. This study found that the longer candidates waited to take the exam, the harder it was for them to pass. While the lag time did not necessarily lead to failure of the NCLEX-RN, the researchers believed that delay would compromise the test takers' ability to apply their nursing knowledge and therefore lessen their likelihood to pass the examination. In this sample, most candidates waited approximately 35 days ($SD = 28.30$) after receiving clearance to take the exam. On the contrary, the participants in a study by Eddy and Epeneter (2002) believed their likelihood of passing was compromised when they were pressured to take the examination early before they were ready. In this sample, students who failed took the examination approximately four weeks (30 days) ($M = 3.77$) after graduation.

The National Council Licensure Examination for Registered Nurses is a high-stakes examination. Nearly 17% of NCLEX-RN applicants failed the examination on their first attempt in 2013 (National Council of State Boards of Nursing, 2013g). The consequences of failing the NCLEX-RN can be far-reaching, affecting not only

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individual students but also nurse educators, nursing programs, healthcare facilities, and patients who need highly qualified professionals to manage their care.

Nursing programs with low first-time NCLEX-RN pass rates were often presumed to deliver inferior-quality instruction (Aucoin & Treas, 2005; Pennington & Spurlock, 2010). Prospective students and their parents may infer that getting nursing education at a school with low pass rates is a poor educational investment, therefore, dampen a university's recruitment and retention efforts.

A justification to increase enrollment is a reasonable approach to ameliorate the nursing shortage. Unfortunately, such approach, as chronicled by Taylor et al. (2014), led to acceptance of more nursing candidates who met the admission standards but were less able to overcome rigorous academic challenges. Taylor et al. charged that first time NCLEX-RN pass rates did not necessarily correlate with excellence in nursing education. Reliance on first-time pass rate alone as an indicator of program success not only undermined teaching creativity and accountability, but also provided justification for progression policies that ultimately resulted in preventing disenfranchised students from taking the NCLEX-RN (Giddens, 2009; Spurlock, 2013). Elimination of minority students and others with poor-test-taking skills for the sake of first-time pass rate would further hamper the effort to improve diversity in nursing workforce and nursing professional sustainability (Giddens). The extent of progression policies often involved more high-stakes examinations to assess students' readiness for the NCLEX-RN by external vendors—a practice adopted by many nursing programs across the country (see Young & Wilson, 2013).

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The mark of excellence in nursing education should include an ongoing support for at-risk students who might otherwise not be successful on their first attempt (Taylor et al., 2014). Therefore, measurement of nursing program success should include documentation of students' second attempt in passing the licensure examination, attrition, and completion rates (Giddens, 2009; Spurlock, 2013; Taylor et al.).

Faculty members must consider the impact of intellectual, social, and emotional interactions in the learning process (Ambrose et al., 2010). Novice undergraduate learners, such as those in SAUs AS nursing population, may require personal investment and a supportive academic environment from faculty members.

Methodology

Research Design

Logistic regression analysis was used to explore relationships between independent and dependent variables. Additional exploratory data analysis using Chi-square test for association between NCLEX-RN outcomes (pass or fail) and selected independent variables were also performed.

Population and Sample

The study sample consisted of nursing students ($N =838$) who were accepted into the associate of science nursing program at Southern Adventist University, Collegedale, Tennessee. The majority of sample for this study consisted of traditional undergraduate students who began college immediately after graduating from high school (American Association of Colleges of Nursing, 2005). They did not meet the established age patterns

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nor had responsibilities of undergraduate students enrolled in most associate nursing

programs in this country (see Kaufman, 2013). Some students were still living at home,

in dormitories, or university housings. Some completed their nursing education before the

age of 21.

More than half of the study population (75.2%) was female ($n = 630$). The ages

ranged from 17 years to 30 years of age ($M = 20.00$) upon enrollment in the NRSG 106

(Fundamentals 1) course. The majority of the sample was comprised of 548 Whites, not

of Hispanic origin (65.4%). Of the remaining students, 116 were Hispanics (13.8%), 89

Asians/Pacific Islanders (10.6%), 67 Blacks, not of Hispanic origin (8%), and 18 missing

or other (2.1%). American Indians/Alaska Natives and those who did not provide their

ethnicity or race were listed as missing.

Delimitations

This study was delimited to AS nursing students who began the program during

consecutive fall to winter or winter to fall semesters, completing the program between

winter 2006 and winter 2014 semesters. In addition, inclusion criteria were a recorded

NCLEX-RN result (pass or fail) and age. Only students younger than 31 years of age

upon enrollment in NRSG 106 (Fundamentals I) course were included in this study.

Students who were accepted into the nursing program through the university's Summer

Study Option (SSO); held a professional nursing license such as Licensed Practical or

Vocational Nursing; and/or did not take level I core nursing courses (NRSG 106 or

NRSG 107) at SAU were excluded from the study.

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Variables

The theoretical frameworks underpinning this dissertation study are the Student Involvement theory (Astin, 1999) and the Input-Environmental-Outcome (I-E-O) model (Astin, 1997). These frameworks (see Figure 1) have guided selection of the predictor variables. The academic variables were comprised of ACT college readiness assessment scores, admission cumulative GPA, grades in pre-requisite courses and core nursing courses, and HESI (E^2) test scores. The number of days between licensure preparation and NCLEX-RN testing was also included in this segment.

Non-academic factors in this study included age at the time of nursing program admission or enrollment in Fundamentals I (NRSG 106), gender, and ethnicity. The study also examined potential impact of language comprehension or ESL (English as a second language) background, and the number of attempts required to complete core nursing courses in order to meet graduation requirements.

Procedures

All academic and non-academic variables and high school information were extracted from the Student Information System. The majority of the NCLEX-RN results were collected from the NCLEX-RN Pass Rates Quarterly Reports which were provided by the National Council of State Boards of Nursing (NCSBN) to every board member jurisdiction. Missing examination results were researched online through websites provided by the NCSBN or states of original licensure application. All students' data that met the inclusion criteria were analyzed and entered into an Excel spreadsheet. A data dictionary was created to organize data collection and maintain accuracy of information.

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Once data collection was completed, the information was then migrated into SPSS for statistical analysis.

Results and Major Findings

The results of this study demonstrate correlation of academic and non-academic variables in predicting NCLEX-RN success in this sample of traditional nursing students. Some of the predictor variables are consistently significant in at least two models.

Research Question 1

The Demographic model indicated ethnicity and gender were statistically significant in NCLEX-RN success. In reference to Caucasians, all minority groups (Hispanics, Asians, and Blacks) were less likely than Caucasians to perform well on NCLEX-RN. Males in this sample were less likely than female students to pass the licensure examination. The odds ratio of Hierarchical model demonstrated that a Hispanic student was five times less likely than a Caucasian student, as the reference, to perform well on the NCLEX-RN. Similarly, a Black student, in reference to a Caucasian, was also three times less likely to do well in the NCLEX-RN. Ethnicity contributed to a substantive negative impact in all models but not age.

In terms of ESL or language background, a chi-square test for association revealed no association between this variable and the NCLEX-RN. In terms of attempts in completing the core nursing courses, a chi-square test for association indicated that students without any course withdrawals or repeats were more successful on the NCLEX-RN. Having to repeat a core nursing course might compromise a student's ability to pass the NCLEX-RN.

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Research Question 2

Both ACT reading and admission GPA variables were statistically significant of NCLEX-RN success in the Pre-nursing Admission Test Score model. A one point increase in ACT reading score, however, increases the odds of being successful on NCLEX-RN by 1.2 points only. Thus, the impact of this variable is negligible in this study population. It is worthy to note that a one point increase in admission GPA increases the odds of being successful on NCLEX-RN by almost five times. In the Hierarchical model, admission GPA became non-significant when the rest of academic variables were entered into the equation.

In terms of predictive ability of pre-requisite courses on NCLEX-RN success, Nutrition was the only significant variable. The remaining five pre-requisite courses did not contribute to the prediction of successful NCLEX-RN outcome in any models.

Research Question 3

The results of the Core Nursing Course model demonstrated that students with higher grades in Adult Health III ($M = 3.13$, $SD = 0.47$, $p = < .05$, $OR = 3.0$), Childbearing Family ($M = 3.39$, $SD = 0.42$, $p = < .05$, $OR = 2.9$), Mental Health ($M = 3.29$, $SD = 0.46$, $p = < .01$, $OR = 3.0$), Adult Health I ($M = 3.41$, $SD = 0.44$, $p = < .05$, $OR = 2.8$), and Fundamentals I ($M = 3.38$, $SD = 0.44$, $p = < .05$, $OR = 2.1$) were more likely to be successful in passing the NCLEX-RN. Of eight core nursing courses included this study, Adult Health III, Mental Health, and Adult I were consistent and contribute to a substantive positive impact of NCLEX-RN success in the Hierarchical model.

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HESI (E^2) score and NCLEX-RN delay were significant but not strong predictors of NCLEX-RN success in the NCLEX-RN Preparation model. There was an inverse correlation between NCLEX-RN success and delay to testing; however, the odds of a student passing the examination (*OR* = 1.0) was not affected by this variable. Similarly, the odds of passing the examination was not affected by the HESI (E^2) score (*OR* = 1.0). These odds ratios indicate no significant impact of these variables. Logically, these predictor variables became non-significant in the Hierarchical model.

Research Question 4

The results of the full Hierarchical model demonstrated that when all predictor variables were entered into the equation only ethnicity, ACT reading (*M* = 24.41, *SD* = 5.08, *p* = < .001, *OR* = 1.2), Adult Health III (*M* = 3.13, *SD* = 0.47, *p* = < .05, *OR* = 4.1), Mental Health (*M* = 3.29, *SD* = 0.46, *p* = < .01, *OR* = 5.0), and Adult Health I (*M* = 3.41, *SD* = 0.44, *p* = < .05, *OR* = 3.2) were significant in predicting the NCLEX-RN outcome in this sample population. ACT reading score, in particular, was consistently significant but of no practical importance in predicting NCLEX-RN success in all models. The odds ratio of passing the NCLEX-RN in terms of ACT reading score was the same in all models. In terms of ethnicity, a Hispanic student was five times less likely than a Caucasian student, as the reference, to perform well in the NCLEX-RN. A Black student, in reference to a Caucasian, was three times less likely to do well in the NCLEX-RN. These odds ratios indicate a strong negative impact on NCLEX-RN outcomes for these groups of students.

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Discussion of the Results

This study sought to identify academic and non-academic factors that may predict a successful NCLEX-RN outcome on first attempt among a sample of traditional undergraduate students who completed the associate of science (AS) nursing program at Southern Adventist University.

The results indicate that a minority student was consistently less likely to pass the NCLEX-RN than a Caucasian student. The result regarding the minority students' performance on NCLEX-RN in this study is shared by another finding (see Haas et al., 2003). A study by Higgins (2005), however, did not find correlation between age, gender, and ethnicity and NCLEX-RN. Likewise, in my study, gender and age did not contribute in predicting NCLEX-RN success, particularly in the Hierarchical model, when other academic and non-academic factors are entered into the equation (see Table 19). While age is not a predictor of success in this study, other researchers have found relationships between age and NCLEX-RN outcomes (e.g.: Beeson & Kissling, 2001; Haas et al., 2003; Trofino, 2013). The unique mean age of this study population is at least 5 years younger than the average age of nursing students in this country and likely accounts for these discrepancies in findings.

The ACT reading score in this study sample ranged from 11 to 36 ($M = 24.7$). Students who passed the NCLEX-RN on first attempt had higher mean ACT reading score, almost five points more than mean average of those who failed. This study demonstrates that ACT reading was consistently significant but of no practical value in predicting NCLEX-RN success (see Table 15, 19, and 20). Although there were inconsistencies regarding the correlation of English grades and/or scores on standardized

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examinations that focused on English reading or English comprehension and NCLEX-RN success (e.g.: Grossbach & Kunchel, 2011; Higgins, 2005; Yin & Burger, 2003), this finding is corroborated by the literature. Gilmore (2008) concluded that students with high ACT reading and English scores would perform better in school and eventually the NCLEX-RN. English language proficiency can become a barrier of success in passing NCLEX-RN.

The chi-square test for association result from this dissertation study showed no significant correlation between ESL background and the NCLEX-RN ($\chi^2 (1) = .001$, $p = .980$). This result may be due to small population sample of students with ESL background. Similarly, ESL background did not play a role in NCLEX-RN outcome in another study population (Uyehara et al., 2007). Yet, several other studies have identified students who do not speak English as their primary language to be at risk for failing the NCLEX-RN (e.g.: Bosher & Bowles, 2008; Caputi & Engelmann, 2008; Cunningham et al., 2004; Hansen & Beaver, 2012; Silvestri et al., 2013). It is reasonable to expect that students preparing to function as a healthcare provider have adequate comprehension of the English language. However, reports issued by authors affiliated with the National Council of State Boards of Nursing claimed that the ability of a nursing candidate to pass the examination is determined by their nursing knowledge rather than the candidates reading ability (O'Neill, 2004; Woo & Dragan, 2012).

The current study demonstrates that admission cumulative GPA was a significant predictor in the Pre-nursing Admission Test Score model (see Table 15). A one point increase in admission GPA increases the odds of passing NCLEX by almost five times. Students who passed were admitted with approximately 0.5 point higher than the current

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minimum admission cumulative GPA requirement. It is reasonable to conclude that the students with higher GPA are more likely to be ready to face the rigor of academic challenge. Evaluation of student performance using academic criteria, in particular, is a standard practice to measure academic potential and growth (Astin 1997, 1999). This selection process operates under the premise that high-performance students—those with higher tests scores or grades—perform better in nursing school and ultimately pass the NCLEX-RN. This result is supported by the literature. Yin and Burger (2003) discovered that students admitted into the nursing program with a mean GPA of 3.2 did better on the NCLEX-RN.

This study also identifies NRNT 125 (Nutrition), a pre-requisite course, as a significant predictor of NCLEX-RN success in the Pre-requisite Course model (see table 16) but not in the Hierarchical model (see Table 19). Noticeably, when all academic variables are added into the equation, Nutrition does not have a strong predictive power. Student understanding of nutrition concepts, however, is an important factor to consider for two reasons. First, the information gained from this class can help a student teach patients to make wise choices toward healthier eating habits and lifestyles. Second, Nutrition is the only pre-requisite course that follows testing conditions similar to those imposed by the nursing program. I have not found recent studies that support this finding. The majority of studies have evaluated correlation of other pre-requisite courses such as Anatomy and Physiology, Pathophysiology, Chemistry, or Microbiology (see Seldomridge & DiBartolo, 2004; Silvestri et al. 2013, Trofino, 2013) but not Nutrition.

The study demonstrates that Adult Health III, Mental Health, and Adult Health I are consistently significant predictors of NCLEX-RN success in all models (see Table 17,

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19, and 20). This becomes important information since the nursing curriculum is designed to build from simple to more complex concepts as the student progresses. The content presented in each course builds on prior knowledge that is expanded in each subsequent course concepts. Two of the predictor core courses (Mental Health and Adult Health I) are offered early in the curriculum and one in the last semester (Adult Health III).

Students with higher grades in NRSG 305 (Adult Health III) ($M = 3.2$), NRSG 130 (Mental Health) ($M = 3.3$), and NRSG 126 (Adult Health I) ($M = 3.5$) are more likely to be successful on NCLEX-RN. A one point increase in Adult Health III, Mental Health, and Adult Health I grades increases the odds of being successful on the examination by four, five, and three times respectively (see Table 19 and 20).

The findings are corroborated by studies in the literature. For example, Landry et al. (2010) found moderate correlation between Psychiatric/Mental Health Nursing (similar to Mental Health) and NCLEX-RN success. Other studies (e.g.: Penprase et al., 2013; Seldomridge & DiBartolo, 2004; Silvestri et al., 2013; Trofino, 2013) found high correlation between Medical-Surgical Nursing (similar to Adult Health III and Adult Health I) and NCLEX-RN success. A correlation between a student's grades in Medical-Surgical Nursing courses and his or her success on the NCLEX-RN is further corroborated by the NCSBN, the governing body responsible for development of examinations questions for all pre-licensure candidates in the United States (National Council of State Boards of Nursing, 2012).

Both NRSG 130 (Mental Health) and NRSG 126 (Adult Health I) are offered in the second semester (level II), following successful completion of the Fundamentals

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courses (level I). At level II, the students are exposed to more challenging nursing concepts and expected to make more concerted effort to engage in critical thinking applications and constructive learning activities. Students' performance in these classes can be used to identify students who may be at risk of not completing the program or ultimately fail the licensing examination. Early interventions at this level can help at-risk students become more successful academically, professionally, and pass the NCLEX-RN on first attempt. This notion is supported by another study. Students' performance in an introductory Medical-Surgical course can serve as an excellent tool to assist students who may be facing academic difficulties (Penprase et al., 2013).

The HESI (E^2) score is not a strong predictor of NCLEX-RN success (see Table 18 and 19). When all academic variables are added into the equation, the NCLEX-RN outcome can be explained by interactions of other variables. This becomes vital information (see Conclusions and Recommendations), since students with a score below the benchmark are required to complete a remediation plan. This practice is supported by studies in the literature (e.g.: Harding, 2010; Morrison et al., 2008; Yoho et al., 2007; Young & Wilson, 2013). However, relying on one single standardized exit examination to determine students' readiness for the NCLEX-RN is controversial (e.g.: Giddens, 2009; Spurlock, 2013; Spurlock & Hunt, 2008; Taylor et al., 2014). Critics of this practice claim that utilization of a standardized exit examination to evaluate NCLEX-RN readiness may lead to development of unwarranted progression policies without taking into account other known or unknown factors that may contribute to this academic debacle.

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Another result in this study indicates that a delay in NCLEX-RN testing is not a strong predictor in NCLEX-RN success (see Table 19). When all academic variables are added into the equation, the NCLEX-RN outcome can be explained by interaction of other variables. It is apparent that students who passed took the examination sooner than those who failed (see Table 10), but a delay in NCLEX-RN testing is not a predictor of success in this study population.

There were inconsistencies in the literature regarding the correlation between a delay in taking the examination and examination results. Woo et al. (2009) found an inverse correlation between NCLEX-RN outcome and lag time to testing. The researchers believed that delay in testing would compromise the test takers' ability to apply their nursing knowledge and lessen their likelihood of passing the examination. On the contrary, the participants in a study by Eddy and Epeneter (2002) believed their likelihood to pass was compromised when they were pressured to take the examination early before they were ready.

Another result from this dissertation study indicates that the majority of students who passed on first attempt never repeated a core nursing course. In this case, the students had eight documented core nursing courses in their student records. The first time pass rate in this study population declined with an increase in the number of repeated courses (see Table 14). First attempt NCLEX-RN success by students who never repeated a core nursing course is in agreement with another study. Trofino (2013) discovered that a student who never repeated a didactic nursing course before was almost four times more likely to pass the licensure examination.

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Limitations

Several limitations were identified during data collection and analysis. The foremost limitation is that the data were delimited to one particular religiously affiliated institution. In addition, the student sample examined in this study was comprised almost exclusively of traditional undergraduate nursing students ($N = 838$, $n = 831$, 95.6%). Some began their AS nursing education at age 17 and graduated before they could even legally purchase alcohol. Nationally, the majority of the AS nursing students are over the age of 30 and have responsibilities outside their academic demands (e.g.: Kaufman, 2013; National Center for Education Statistics, 2002). Thus, the majority of students in this study do not reflect the typical age patterns or responsibility patterns of most students enrolled in AS nursing programs in the U.S. Because of these factors, the generalizability of the study findings may be limited.

The next limitation is related to a change in one of the SAU nursing program admission policies that led to missing ACT reading scores. Similarly, there were also missing pre-requisite science grades noted during data collection. Students who completed a pre-requisite course elsewhere did not have a grade assigned in their transcript. Although the minimum sample requirement to perform a full logistic regression analysis after listwise deletion was adequate, it is unknown if having complete data would have affected the results.

There was also missing documentation of several NCLEX-RN test dates and results of students who sought licensure from states other than TN. Missing data were located online and some missing test dates were substituted with original NCLEX-RN

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licensure release date. A delay between test dates and licensure release date online varies from state to state.

Another limitation is related to inadequate ways to verify ESL background from the Student Information System. It was discovered during data collection that international students who began their education in the U.S. from high school may not have to take TOEFL or ESL courses in college. Furthermore, students who are not native English speakers or speak English as an additional language do not necessarily have to take TOEFL/ESL courses as long as they meet university and nursing program admission requirements. Therefore, it is difficult to assess a student's ESL status/background by evaluating only the student records.

The final limitation is related to cases of course forgiveness granted by the admission committee. Since this study only collected the cumulative pre-nursing GPA as found on the Student Information System, the actual numbers of course forgiveness that took place in this study sample is unknown, especially if the admission cumulative GPA met the minimum admission requirement after course forgiveness was granted. Perhaps, if all data collection was done under ideal conditions, the conclusions of this dissertation study may have been different.

Conclusions

This study identified academic and non-academic factors that are highly correlated with NCLEX-RN success. The information can be used to provide evidence-based admission practices and strategic interventions for students at risk of academic failure. Hispanic and Black students can be described as "at risk" in terms of achieving

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positive NCLEX-RN outcomes. This is an area of concern if the university is to maintain its excellent reputation as a provider of nursing education.

This study identified that students admitted with a higher admission cumulative GPA and reading score are better equipped for the rigor of the academic challenges of a nursing program. Students with stronger prior knowledge and critical thinking abilities, as evidence by higher grade in three core nursing courses, Adult Health I, Mental Health, and Adult Health III nursing, are more likely to perform well on the NCLEX-RN. The study results also indicate that students with strong academic profiles demonstrate mastery of the nursing content, and yet students with less than perfect academic profiles do not necessarily reduce their likelihood to succeed or ability to pass the examination on first attempt. Early interventions offer a fair chance for every student to become more successful academically and professionally.

Attempts in generalization of NCLEX-RN findings are frequently challenged by interactions between academic and non-academic variables and unforeseeable variables for a specific student or a study population. Changes in rules and regulations, including the passing standard by external governing bodies may also complicate the process. This study has employed common academic and non-academic variables that are used in almost all types of national pre-licensure nursing programs. Readers, under similar circumstances, can gain insights from results and lessons learned in this study.

The devastating consequences of NCLEX-RN failure can be far-reaching, affecting not only nursing students but also nursing programs, and patients who need professional nursing care. Despite complex challenges associated with NCLEX-RN studies and limited generalizability of findings, the urgency to find solutions that promote

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academic success, professional growth, and patient safety will undoubtedly inspire additional research.

<h3 style="text-align:center">Recommendations for Practice and Future Research</h3>

Identification of specific variables that facilitate traditional AS nursing students' success academically and professionally can help the SAU AS nursing program strengthen its academic policies and procedures, and that, in turn will help increase the supply of younger nurses into the workforce. The following recommendations for practice and future research are based on the findings in this study.

The result NCLEX-RN performance among minority students in this study sample is an area of concern. The effort to deliver diversity into nursing workforce is hampered when fewer minority students pass the NCLEX-RN (see Giddens, 2009). Furthermore, with predicted population growth among minority groups in the U.S. population (Colby & Ortman, 2015), this issue is becoming more pressing. Therefore, it is recommended that the program seeks advice from experts to develop intentional, strategic practices, policies, and interventions to improve minority students' outcomes on the NCLEX-RN. Interventions could include remedial courses or tutoring in reading, training for nursing in culturally appropriate pedagogies, cultural competence, and similar training to foster peer mentoring or tutoring programs.

It is recommended that the ACT reading score be added as part of the admission ranking formula. Students applying to the nursing program should be required to have an acceptable ACT reading score or take an alternative test that has the same quality and strength comparable with the ACT reading. Since the odds of passing the examination

<div style="text-align:center">133</div>

increases by only 1.2 points for every one point increase in ACT reading score, it is not necessary for the program to increase the current minimum admission ACT score of 20. It is advisable that the university considers offering reading remediation programs for freshmen students planning to major in nursing. Ultimately, reading remediation programs will prepare more young students into the nursing workforce.

Since students with higher admission cumulative GPA ($M = 3.39$) are associated with successful NCLEX-RN outcome, it is recommended that the nursing program considers raising the minimum (pre-nursing) admission GPA requirement to more than 2.9 as part of the admission selection.

Since NRNT 125 (Nutrition) is another significant pre-nursing predictor of NCLEX-RN success, it is also recommended for the nursing program to include applicants' grades in this course as part of the admission ranking formula.

It is crucial for the nursing program to follow evidence-based practices. Every student admitted into the program deserves a fair chance to become successful academically and professionally. It is recommended for the program to provide comprehensive assessment of students' performance upon completion of NRSG 130 (Mental Health) and NRSG 126 (Adult Health I). Since both courses are offered in the second semester of the course sequence, the results can be used to provide strategic interventions for students who may be facing academic difficulties or students with poor testing skills, at least one year prior to graduation. It is recommended that the program rearrange the last semester schedule of the nursing courses to allow additional exposure to NRSG 305 (Adult Health III) content and more time for a guided NCLEX-RN preparation, at least one month prior to graduation.

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The SAU nursing program NCLEX-RN failure rates among first-time test takers is an area of concern that led to formulation of this study. The nursing program may be placed under probation if its nursing students' annual NCLEX-RN pass-rate does not meet the 85% benchmark set by the governing bodies (Accreditation Commission for Education in Nursing, 2013; Tennessee Board of Nursing Position Statements, 2012). Since the pass rate of students who repeated one core nursing course was 10% lower than students who did not repeat any core courses, the program should review its current progression policy and develop specific NCLEX-RN remedial interventions for students who repeat any core nursing courses. One potential intervention could include one-on-one test preparation meetings with the ASAP (Assisting Students to Achieve Professionally) professor and/or content experts before the students are scheduled to take the licensure examination.

An issue surrounding course forgiveness became apparent during data collection. It is recommended for the nursing program develop a transparent policy on course forgiveness. It's also advisable to conduct a study to evaluate academic performance and NCLEX-RN outcome of students who received such a provision.

Identification of students with ESL background was another issue during data collection. It is recommended for the nursing program to identify freshmen nursing students who do not speak English as their first language or speak English as an additional language. Another study is recommended to re-evaluate impact of English language proficiency and the NCLEX-RN to see if a larger sample would lead to similar result.

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Enrollment into the nursing program at SAU was increased at the beginning of winter 2010 semester. The literature indicated that such practice may lead to acceptance of more students who are less prepared for rigorous academic challenge (Taylor et al., 2014). In light of this finding, it is recommended that the program conducts a study to evaluate if higher enrollment has caused higher attrition rate and lower NCLEX-RN pass rate.

The program has utilized results from a standardized exit examination to evaluate students' readiness for the NCLEX-RN and guide remediation plans. Students performance on HESI (E^2) does not affect the odds of passing the NCLEX-RN population in this sample. The NCLEX-RN outcome can be explained by interactions of other variables in the equation (see Table 19). The literature has indicated that relying on one examination to predict NCLEX-RN success may lead to development of unwarranted progression policies (Giddens, 2009; Spurlock, 2013; Taylor et al., 2014). There are a multitude of factors (intellectual, social, and emotional) that may impact a student's performance academically (Ambrose et al., 2010; Astin, 1997; Silvestri, 2013). Novice undergraduate students may require additional personal investment and more supportive academic environment from faculty members than what is currently provided. Therefore, it is recommended that the nursing program re-evaluate current learning resources and progression policies. It is also recommended that the program consider other options to determine student readiness, and conduct a study to evaluate validity of remedial interventions.

The unprecedented NCLEX-RN failure rates for the past three years have taken the SAU nursing faculty by surprise. If I were to conduct a similar research again,

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consideration would be given to include a qualitative component into the study approach. A qualitative approach is useful to gain a broader understanding of underlying unknown factors that cannot be observed by evaluating academic and non-academic profiles from student records only. The unknown factors may include the amount and extent of NCLEX-RN preparation students undertake prior to taking the examination. This unknown factor may explain the non-significant correlation of NCLEX-RN delay (the number of days between graduation or licensure preparation and NCLEX-RN testing) in this population. I would also consider conducting a study to see if there are correlations in nursing competency and/or any breach of patient safety between newly licensed nurses who pass the examination on first attempt in comparison with newly licensed nurses who fail it on first attempt. The literature has also indicated that reliance on NCLEX-RN pass-rate as a hallmark of a nursing program success may lead to the development of unwarranted progression policies (Giddens, 2009; Spurlock, 2013; Taylor et al., 2014). The complexity of academic, non-academic, and unknown factors that may influence a student performance on the NCLEX-RN should be carefully examined when discussing the value and implications of the NCLEX-RN pass rates as a measure of a nursing program's success and/or ability to deliver superior nursing education.

APPENDIX A

IRB ANDREWS UNIVERSITY

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Andrews ◆ University
Office of Research & Creative Scholarship

May 5, 2014

Christine Moniyung
Tel: (423) 774-1445
Email: cmoniyung@southern.edu

RE: APPLICATION FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS
IRB Protocol #: 14-059   **Application Type:** Original   **Dept.:** Graduate Pschology & Counseling
Review Category: Expedited   **Action Taken:** Approved   **Advisor:** Jimmy Kijai
Title: NCLEX-RN Outcomes Predictors: The Roles of Academic and Nonacademic Variables in a
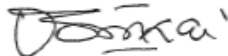Traditional Associate Degree College Student Population.

This letter is to advise you that the Institutional Review Board (IRB) has reviewed and
approved your IRB application of research involving human subjects entitled: *"NCLEX-RN
Outcomes Predictors: The Roles of Academic and Nonacademic Variables in a
Traditional Associate Degree College Student Population"* IRB protocol number 14-059
under Expedited category. This approval is valid until May 5, 2015. If your research is not
completed by the end of this period you must apply for an extension at least four weeks
prior to the expiration date. We ask that you inform IRB whenever you complete your
research. Please reference the protocol number in future correspondence regarding this
study.

Any future changes made to the study design and/or consent form require prior approval
from the IRB before such changes can be implemented. Please use the attached report
form to request for modifications, extension and completion of your study.

While there appears to be no more than minimum risk with your study, should an
incidence occur that results in a research-related adverse reaction and/or physical injury,
this must be reported immediately in writing to the IRB. Any project-related physical
injury must also be reported immediately to the University physician, Dr. Reichert, by
calling (269) 473-2222. Please feel free to contact our office if you have questions.

Best wishes in your research.

Sincerely

Mordekai Ongo
Research Integrity & Compliance Officer

Institutional Review Board - 4150 Administration Dr Room 322 - Berrien Springs, MI 49104-0355
Tel: (269) 471-6361 Fax: (269) 471-6543 E-mail: irb@andrews.edu

APPENDIX B

IRB SOUTHERN ADVENTIST UNIVERSITY

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April 10, 2014

Primary Investigator: Christine Moniyung

Research Project: NCLEX-RN Outcomes Predictors: The Roles of Academic and Nonacademic Variables in a Traditional Associate Degree College Student Population

IRB Tracking Number: 2013-2014-052

Dear Christine,

It is a delight to inform you that three Institutional Review Board Members examined your research study proposal and supporting documents at the IRB committee and have voted to approve your research. We wish you the very best as you move forward with this study and look forward to reading your findings when they are ready.

If there are minor changes to this research, before making those changes please notify us by completing and submitting Form B (Certification for Modification, Annual Review, or Project Termination/Completion). Please submit applications to irb@southern.edu. If substantial changes are planned you, as the principal investigator, should submit a new IRB application.

Many blessings to you as you move forward. Please let us know if there is anything else we can do to assist you with this research study.

Always in His service,

Cynthia

Cynthia Gettys, Ph.D.
IRB Chair
Southern Adventist University
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"I applied my mind to **study** and to explore by wisdom all that is done under the heavens…" Ecclesiastes 2:13

"Research is to see what everybody else has seen and to think what nobody else has thought." Albert Szent-Gyorgyi

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