

ABSTRACT

DAVIS, ALICIA DEBRA. Predicting Persistence in Practical Nursing and Success on the NCLEX-PN: Examining Demographic, Non-Academic, and Academic Variables. (Under the direction of Dr. James Bartlett.)

The United States is now in the midst of a major nursing shortage that is predicted to get worse over the next ten years (Kurzen, 2005). The Health Resources and Services Administration reports that all 50 states will suffer from a nursing shortage by 2020 (U.S. Department of Health and Human Services, 2004). This means that there will be a shortage of over one million nurses by 2020 (Kuehn, 2007). Nursing shortages create situations in which there are not enough nurses to care for patients nor enough nurse faculty to educate the next generation of nurses (Erlen, 2001).

Requirements to be licensed as a nurse include graduation from a state approved nursing program and passing a national examination. Nursing educators must identify predictors that will enhance both persistence in nursing programs and success of passing the licensure examination so that qualified nurses are not delayed from entering the workforce. The purpose of this exploratory study was to use logistic regression analysis to identify those variables that will predict persistence in licensed practical nursing programs as well as those variables that will predict successful passing of the NCLEX-PN licensure examination on the first attempt. Research data was collected from licensed practical nurses in North Carolina. Correlation analysis was used to determine the association between each independent variable and the dependent variables of nursing program persistence and NCLEX-PN results. A logistic analysis technique was used in this study to determine the relationship between those independent variables that showed a significant correlation using the Phi coefficient and point-biserial techniques and the two dependent variables.

The independent variables found to have a statistically significant association (using the Phi coefficient analysis) with the dependent variable of nursing program persistence/retention in this study were father ethnicity, gender, receipt of student loans, the taking of some remedial courses (RED 060, RED 080, ENG 060, ENG 080), the grades of some of the remedial courses (RED 060, RED 080, ENG 060, MAT 080), the requirement of a pre-nursing admission exam, and the offering of remediation at the exit exam point of the nursing program. The Phi coefficient analysis also showed a statistically significant association between the independent variables of one remedial reading course grade (RED 080), the biology transferred grade, pre-nursing college GPA, the offering of remediation at the exit exam point of the nursing program, and the dependent variable of success on the NCLEX-PN.

Receipt of student loans was the only significant contributing variable in predicting nursing program persistence at the .05 level of significance in the binary logistic regression model. Pre-nursing college GPA approached significance at the .053 level in predicting NCLEX-PN success.

In light of the paucity of literature regarding practical nursing program persistence and NCLEX-PN performance and the lack of consistent identified student predictors of retention, graduation, and NCLEX success, the nursing profession needs to continue research in this area.

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Predicting Persistence in Practical Nursing and Success on the NCLEX-PN: Examining
Demographic, Non-Academic, and Academic Variables

by
Alicia Debra Davis

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APPROVED BY:

Dr. James Bartlett
Committee Chair

Dr. Bradley Mehlenbacher

Dr. Duane Akroyd

Dr. Richard Felder

DEDICATION

I dedicate this dissertation to my fellow nursing colleagues. Be ye at the bedside, in the classroom, or somewhere in between, may we never lose our number one focus. I also dedicate this dissertation to my dad. He was my shining star, and he still burns brightly in my heart.

BIOGRAPHY

Alicia Debra Davis completed her associate degree in nursing from Central Piedmont Community College in Charlotte, NC. She completed both her bachelor's and master's degrees in nursing from the University of North Carolina in Charlotte. During her career she has held various positions of nursing in the acute, private, academic, and long-term care sectors of patient care.

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There are many of you who have ridden along side of me in this journey. It has been a long one with many twists and turns.

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To my daughters, thank you for your never ending support and encouragement.

Finally, thank you GOD for truly if it wasn't for you none of this would have happened.

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CHAPTER 1: INTRODUCTION

The Health Resources and Services Administration reports that all 50 states will suffer from a nursing shortage by 2020 (U.S. Department of Health and Human Services, 2004). This means that there will be a shortage of over one million nurses by 2020 (Kuehn, 2007). Some factors contributing to this crisis are decreasing enrollment in nursing schools, current nurse retirement, an aging US population that needs nursing services, a shortage of nursing school faculty, expanding career options for women, job burnout, and dissatisfaction (Kurzen, 2005). Keys to being able to work as a licensed practical nurse (LPN) or as a registered nurse (RN) are graduation from an approved nursing program and passing the National Council Licensure Examination (NCLEX). Nursing educators must identify those predictors that will enhance persistence in nursing programs and those that will enhance success of passing the licensure examination so that qualified nurses are not delayed from entering the workforce.

The National Council of State Boards of Nursing (NCSBN, 2010a) estimated that 4,750,334 nurses had active licenses in 2008. Licensed practical nurses represented 27% of that population. Requirements to be licensed as a nurse are graduation from a state approved nursing program and passing a national examination. The National Council Licensure Examination for registered nurses (NCLEX-RN) and the National Council Licensure Examination for practical nurses (NCLEX-PN) are administered on behalf of NCSBN's 59 member boards of nursing. Members include all 50 states, the District of Columbia, and four US territories (American Samoa, Guam, Northern Mariana Islands, and Virgin Islands). California, Georgia, Louisiana, and West Virginia have separate RN and PN/VN boards of

nursing. The purpose of these examinations is to determine if a candidate possesses the minimum knowledge and abilities to provide entry-level nursing care that is safe and effective (National Council of State Boards of Nursing, 2009).

To ensure a consistent standard of competence in nursing practice, NCSBN uses a criterion referenced standard, which means that passing or failing depends solely upon a candidate's level of performance in relation to the established point that represents safe entry-level competence. Candidate performance on the NCLEX examination is reported only as a pass-fail decision. In 2008, 61,770 students took the NCLEX-PN for the first time. Of that group of students, 52,888 passed the first time for an 85.6% pass rate. North Carolina ranked 15th nationally with a passing average of 92.6%. First time pass rates for practical nurses (PN) ranged from 88% to 92% from 1994 through 2008. However, first time PN candidates pass rates, which range from 89.1% in 2005 to 85.72% in 2009, have been declining for the last five years (National Council of State Boards of Nursing, 2010a).

Student performance on the NCLEX-RN and the NCLEX-PN has important ramifications for administrators, faculty, parents, and students enrolled in nursing programs (Garlough, 2003; Higgins, 2005; Waterhouse, Bucher, & Beeman, 1994). These authors contend that the challenge of facilitating success can be seen as two-fold. First, an accurate and timely method of prediction of student success is necessary. Once established, early identification of students at risk can occur. After this, the remaining challenge is the identification and accessibility of educational interventions designed to facilitate success on the NCLEX. These authors further posit that wrongful predictions of student success or failure could have adverse effects, ranging from undue emotional stress and test anxiety to

altered levels of self-esteem and confidence. Faculty have a moral obligation to provide scientifically sound information to students (Waterhouse et al., 1994).

The admission process for healthcare students is very competitive with more applicants than available spaces (Nayer, 1992; Salvatori, 2001). As Nayer (1992) suggests, “The purpose of admission procedures is to select students who will complete the educational program and go into professional careers, do well in the program, perform creditably in professional practice and possess the traits of character and ethical values desired of a professional person” (p.41). Nursing faculty are obligated to ensure that the selection process for nursing applicants is fair. They should take into account variables known to ensure persistence in the program and variables that indicate potential to pass the licensure exam (Ostrye, 2001). Various factors including preadmission testing, English as a Second Language (ESL), cultural diversity, grade point average (GPA), American College Test (ACT) scores, age, family history, race, and gender have been identified as affecting persistence and retention rates (Tinto, 1975), as well as NCLEX success (Alexander & Brophy, 1997; Hawsey, 1997; Hereford, 2005; & Humphreys, 2008; Porter, 2008).

The recent shortage of nurses has many ramifications. For nursing educators, one consequence has been that many changes have occurred in the nursing licensure process. Prior to 1988 scores were reported as numerical values with the passing score set at 1600 (Foti & DeYoung, 1991) out of a possible score of 3200 (Pangle, 1992). As of July 1988 scores were reported as pass/fail only. It is possible that predictors of NCLEX success on the post 1988 exam will be different from earlier studies (Waterhouse, Carroll, & Beeman, 1993). The method of testing has also changed. Prior to 1994 the NCLEX was a paper and

pencil examination (Wendt, 1999). In 1994 the NCLEX became a computerized adaptive test. Computerized adaptive testing (CAT) is a term used to describe not only the technology (the computer) used to give an examination, but also the theory that is used to make sure the test is accurate and measures what it is supposed to measure (Kurzen, 2005).

The Board of Directors of the NCSBN re-evaluate the passing standard for the NCLEX-PN and the NCLEX-RN every three years to ensure the passing standards accurately reflect the amount of nursing ability required to practice competently at entry level. There is no limit on the information the Board of Directors consider regarding the passing standard, but it usually involves a review of historical passing performance since the implementation of the CAT methodology in 1994, information detailing the educational readiness of high school graduates interested in nursing, results of annual surveys of employers and educators regarding the competence of the current cohort of entry level nurses, and results of a standard setting exercise (Angoff procedure and other statistical result compromise procedures) undertaken by a panel of judges (National Council of State Boards of Nursing, 2010b). The Angoff method is a widely used standard setting approach in test development. Test developers use this kind of study to determine the passing percentage for a test (ALTA, 2008).

The NCSBN Board of Directors voted in December of 2010 to raise the NCLEX-PN standard. The passing standard was changed from -0.37 to -0.27 logits. This change became effective April 1, 2011. A logit is a unit of measurement to report relative differences between candidate ability estimates and item difficulties. Logits are an equal interval level of measurement, which means that the distance between each point on the scale is equal. It puts

candidate ability and item difficulty on the same measurement scale. Candidate ability is determined by the percentage of correct answers and average difficulty of items on the test. Candidate ability has a positive linear relationship with average difficulty. This means that as percent correct holds constant, candidate ability increases as the average difficulty of items get harder and decreases as the average difficulty gets easier. On the other hand, when average item difficulty is held constant, candidate ability varies in a non-linear fashion with percentage correct. The non-linear relation between candidate ability and percentage correct is a result of the log term in the candidate ability calculation (National Council of State Boards of Nursing, n.d.).

Even more important, the change in type of score reporting means that only dichotomous data now can be used in analysis versus the numerical level data previously reported. According to Tabachnik and Fidel (1989) correlations based on a dichotomous variable that fall mostly into one category are substantially lower than correlations between two continuous variables such as numerical scores (as cited in Waterhouse et al., 1993). According to Kerlinger and Lee (2000) “To reduce a set of values with a relatively wide range to a dichotomy is to reduce its variance and thus its possible correlation with other variables” (p. 795).

Background

Nursing has evolved over many hundreds of years. Its evolution can be traced as far back as the 1500s. The first school of nursing was not established in America until 1849 by the Lutheran Order of Deaconesses under the guidance of Theodor Fliedner, a German pastor in Kaiserwerth, Germany (Christensen & Kockrow, 2006). The first school for training the

practical nurse started in Brooklyn, New York in 1892. It trained its students to care for the chronically ill, invalids, children, and the elderly. The main emphasis was on home care and included cooking, nutrition, basic science, and basic nursing procedures. Graduates of this program were called attendant nurses. Two other programs were established in the early 1900s (Christensen & Kockrow, 2006). The increased need for nursing services brought on by World War II resulted in the opening of 260 practical vocational programs between 1948 and 1954. Practical/Vocational schools continued to grow, and as of 2009, 1,119 practical/vocational programs were in existence in the United States, producing thousands of graduates (National Council of State Boards of Nursing, 2009). Before 1860, nursing care in the United States was provided generally by people who were self-taught and who gained what experience they could as they practiced their skills. Registration, licensing, and title differentiation were not clear or were nonexistent. Clearly defined duties and responsibilities were absent (Christensen & Kockrow, 2006). The U.S. Department of Vocational Education commissioned an intensive study of practical/vocational nursing tasks in 1944. As a result of this study, individual state boards of nursing began to specify the duties and responsibilities that could be carried out by the registered nurse and the practical/vocational nurse (Christensen & Kockrow, 2006).

In North Carolina, there are two levels of nursing: registered nursing and licensed practical nursing. Registered nursing is offered through 2-year community colleges, 4-year colleges, and universities. The 2-year nursing program offers an associate degree in nursing, and 4-year colleges and universities offer a bachelor of science in nursing. A licensed practical nurse (LPN) typically has a high school diploma and is trained in a one-year

program at a technical/vocational school or a community college. LPNs are awarded diplomas in nursing and provide care in a variety of settings (Young-Richardson, 1996). These settings include hospitals, long term care facilities, doctor's offices, clinics, and home health.

Statement of the Problem

Since World War II, hospitals in the United States have coped with cyclical shortages of nurses. The shortages have generally been related to economic factors. In the 90s the growth of managed care slowed employment growth for nurses. There was a surplus of nurses; some lost their jobs, and some new nurses were unable to find jobs. It seemed that they might need fewer nurses in the long term, and enrollment in nursing schools declined (Steinbrook, 2002). The current nursing shortage began in 1998 in intensive care units and operating rooms. It has spread throughout all nursing units and is widespread throughout the country (Steinbrook, 2002). The United States is now in the midst of a major nursing shortage that is predicted to get worse over the next ten years (Kurzen, 2005). The Health Resources and Services Administration reports that all 50 states will suffer from a nursing shortage by 2020 (U.S. Department of Health and Human Services, 2004). This means that there will be a shortage of over one million nurses by 2020 (Kuehn, 2007).

Nursing shortages create situations in which there are not enough nurses to care for patients or enough nurse faculty to educate the next generation of nurses (Erlen, 2001). Erlen (2001) adds that individual nurses and patients are feeling the most severe effects of this shortage. Patients and families are aware that there are not enough nurses to provide quality care. There is also research that suggests lower nurse/patient ratios are associated

with lower rates of hospital acquired infections and deaths (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007; Unruh, 2003).

The causes of nursing shortages are varied and complex. This study focuses on two strategies to help address this major issue. The first strategy is to identify those variables that will predict nursing program persistence/retention. The second strategy is to identify those variables that will predict NCLEX success on the first attempt. Recruiting and retaining qualified licensed practical nursing students and assisting them to pass the NCLEX on the first attempt will help ease the burden in the health care community.

The job outlook for LPNs is positive. According to the U.S. Bureau of Labor Statistics (2008), licensed practical and vocation nurses are in the top 30 occupations with the largest projected employment growth from 2008-2018 and in the top 30 with the largest number of total job openings due to growth and replacements.

Statement of Purpose

Requirements to be licensed as a nurse are graduation from a state-approved nursing program and passing a national examination. Nursing educators must identify those predictors that will enhance persistence in nursing programs and those that will enhance success of passing the licensure examination so that qualified nurses are not delayed from entering the workforce.

The purpose of this exploratory study was to use logistic regression analysis to identify those variables that will predict persistence in licensed practical nursing programs as well as those variables that will predict successful passing of the NCLEX-PN licensure examination on the first attempt. Research data was collected from licensed practical nurses

in North Carolina. The predicting variables explored were age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance/aid, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA. These variables have been identified as affecting persistence and retention rates (Tinto, 1975), as well as NCLEX success (Alexander & Brophy, 1997; Hawsey, 1997; Hereford, 2005; Humphreys, 2008; Porter, 2008).

Research Questions

Research Question 1. What is the relationship between the variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA,

completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) and practical nursing program persistence/retention?

Research Question 2. What is the relationship between the variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades , nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) and NCLEX-PN success?

Research Question 3. What set of variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of

children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) provided the best prediction of practical nursing program persistence/retention?

Research Question 4. What set of variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) provided the best prediction of NCLEX-PN success?

Significance of the Study

Student performance on the NCLEX-RN and the NCLEX-PN has important ramifications for administrators, faculty, parents, and students enrolled in nursing programs (Garlough, 2003; Higgins, 2005; Waterhouse et al., 1994). These authors go on to say the challenge of facilitating success can be seen as two-fold. First, an accurate and timely method of prediction of student success is necessary. Once established, early identification of students at risk can occur. After this, the remaining challenge is the identification and accessibility of educational interventions designed to facilitate success on the NCLEX. These authors further posit that wrongful predictions of student success or failure could have adverse effects, ranging from undue emotional stress and test anxiety to altered levels of self-esteem and confidence.

Nurses and nursing faculty are needed so much that Health and Human Secretary Bill Corr announced August 12, 2009 the release of \$13.4 million for loan repayments to nurses who agree to practice in facilities with critical shortages and for schools of nursing to provide loans to students who will become nurse faculty. The funds were made available by the American Recovery and Reinvestment Act signed February 17, 2009 by President Obama (U.S. Department of Health and Human Services, 2009). It is too soon to tell if this Act has indeed lured nurses to those facilities and schools with critical shortages.

Passing the National Council Licensure Examination for Practical Nursing (NCLEX-PN) is critical to students, nursing faculty, college administrators, and the public. Pass rates are measurements used by State Boards of Nursing to determine the viability of sustaining a nursing program; thus, low pass rates could result in the closure of a program. This impacts

faculty as well as college administrators as high pass rates are one marketing tool for recruitment into nursing programs. Failing the exam has financial as well as emotional impact for students. Failing the exam means one less nurse in this severe nursing shortage to care for the sick.

Seago, Spetz, Chapman, & Dyer (2006) state that “the LPN workforce is not being used to its fullest capacity. Employers, state boards of nursing, and educators should strive to ensure that all types of licensed nurses are part of the effort to alleviate the nursing shortage” (p. 49). Lafer and Moss (2007) also stated, “It is ironic that, while the country is facing a critical nursing shortage, the potential of the LPN workforce is so underutilized” (p. 28). According to the U.S. Bureau of Labor Statistics (2008), licensed practical and vocation nurses are in the top 30 occupations with the largest projected employment growth from 2008-2018 and in the top 30 with the largest number of total job openings due to growth and replacements. Nursing programs must quickly identify strategies to help fill these vacancies such as identifying those variables that will predict practical nursing program persistence and NCLEX-PN success. Nursing faculty have an obligation to ensure the selection process for nursing applicants is fair and accounts for those variables known to ensure persistence in the program as well as potential to pass the licensure exam (Ostrye, 2001).

Various factors including but not limited to preadmission testing, English as a Second Language, cultural diversity, GPA, American College Test (ACT) scores, age, family history, race, and gender have been identified as affecting retention rates as well as NCLEX success (Alexander & Brophy, 1997; Hawsey, 1997; Hereford, 2005; Humphries, 2008; Porter, 2008; Tinto, 1975).

This study particularly focused on licensed practical nursing. There is a body of literature that speaks to nursing student success on the NCLEX. Most of the research published, however, is about registered nursing students. There is a body of research that speaks to nursing student program persistence, but again, the research mostly focuses on registered nursing students. There is a lack of information about PN student persistence and NCLEX-PN success. The results of this study will add to that general body of knowledge.

Theoretical Framework

Tinto's (1975, 1987, 1993) model of persistence in higher education provides the theoretical framework for this research. Tinto's original model was called the model of dropout from higher education and was later renamed in 1993 as the longitudinal model of institutional departure.

Tinto (1975, 1987, 1993) has conducted extensive research on dropout in higher education. Tinto proposed in 1975 a theoretical model of dropout behavior based on work in social psychology and from the field of economics. Tinto contends that these different conceptual frameworks seek to explain dropout from a higher educational institutional level rather than from the system of higher educational institutions. According to Tinto, if a model is developed to explain the longitudinal process of interactions that lead differing persons to varying forms of persistence and or dropout behavior, one must build into the model sets of individual characteristics and dispositions relevant to education persistence which includes background characteristics such as social status, high school experiences, community of residence and individual attributes such as sex, ability, race, and ethnicity.

Tinto (1975, 1987, 1993) argues that the process of dropout from college can be viewed as a longitudinal process of interactions between the individual and academic and social systems of the college during which a person's experiences in those systems continually modify the individual's goal and institutional commitments in ways which lead to persistence and/or to varying forms of dropout. Tinto adds that individuals enter institutions of higher education with a variety of attributes (sex, race, ability), precollege experiences (high school GPA, academic and social attainments), and family backgrounds (social status, values climates, expectational climates), each of which has a direct and indirect impact upon performance in college.

Tinto's (1975, 1987, 1993) model argues that it is the individual's integration into the academic and social systems of the college that most directly relate to persistence in that college. Of those characteristics of individuals shown to be related to dropout, the more important pertain to the characteristics of family, the characteristics of the individual, his/her educational experiences prior to college entry, and his/her expectations concerning future educational attainment. Tinto's research will be discussed further in the next chapter. Tinto's longitudinal model of institutional departure is shown in Figure 1.

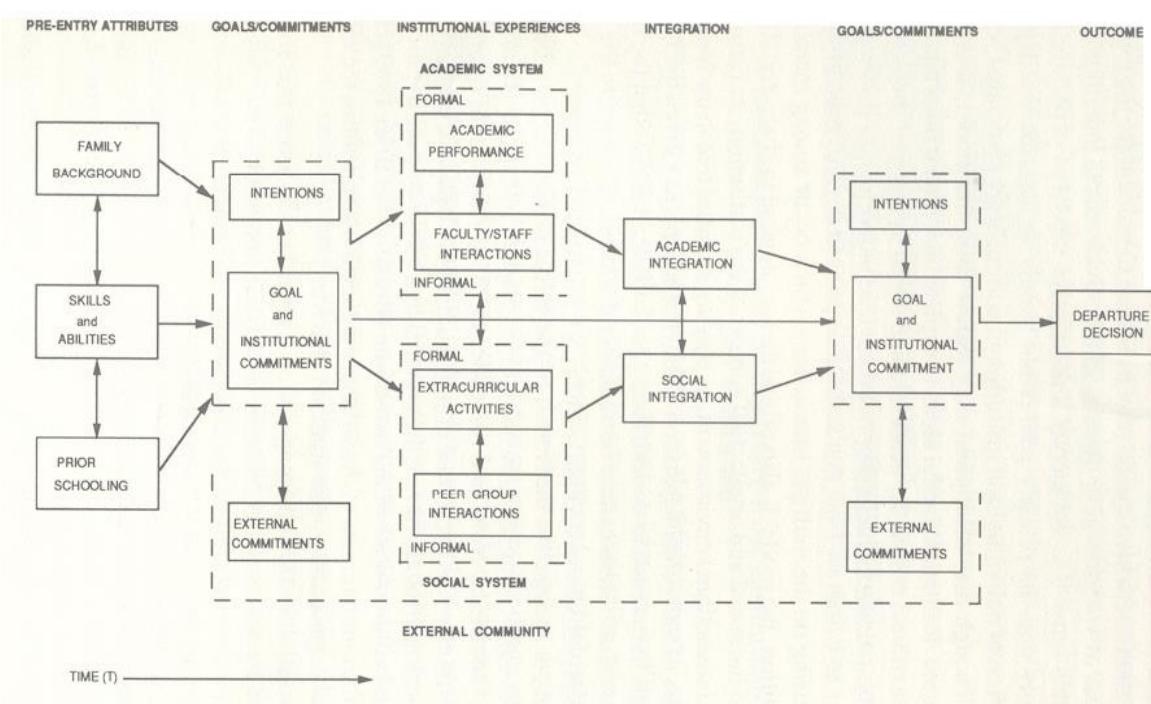


Figure 1. Tinto's longitudinal model of institutional departure. From *Leaving College* (p. 114), by V. Tinto, 1993, Chicago: University of Chicago Press. Copyright 1993 by The University of Chicago. Reprinted with permission.

Conceptual Framework

The conceptual framework emerges from the overall framework. It operationalizes Tinto's model to better fit an ex post facto community college study rather than a university longitudinal study. Basically, there are three steps in the process of becoming a nursing student and successfully passing the NCLEX-PN. First, there are pre-nursing variables such as age, gender, high school performance, ethnicity, pre-college assessment testing, success of remedial courses, and pre-nursing GPA. Second, there are nursing program variables such as anatomy and physiology grades and nursing course grades that ultimately determine persistence in the nursing program. Lastly, there are those variables that predict success on the licensure exam.

Tinto (1975, 1987, 1993) says that individuals enter institutions of higher education with a variety of attributes (sex, race, ability), precollege experiences (high school GPA, academic and social attainments), and family backgrounds (social status, values climates, expectational climates), each of which has a direct and indirect impact upon performance in college. These variables can be defined as inputs into the college experience.

Tinto's model argues that it is the individual's integration into the academic and social systems of the college that most directly relate to persistence in that college. This integration can be defined as throughputs in the college experience. Lastly, in keeping with the requirements to become a licensed nurse, persistence in the nursing program and passing the NCLEX-PN could be defined as outputs of the college experience. See Figure 2 for a model of those steps.

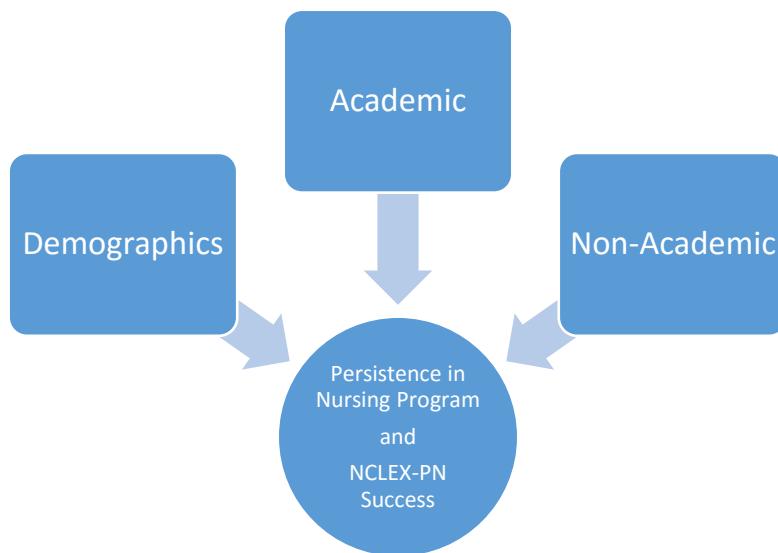


Figure 2. Relationship of Demographic, Academic, and Non-Academic Characteristics on Persistence in Nursing Program and Success on NCLEX-PN

Definition of Terms

For purposes of this study the following operational definitions were used:

1. American College Testing Assessment (ACT) – assesses a student’s knowledge in English, math, social sciences and natural sciences and is usually administered to high school students in preparation for college entry (<http://www.act.org/>, 2010).
2. ASSET Test – a paper and pencil test developed by ACT that measures pre-college student’s basic abilities on writing, numerical, and reading skills (<http://www.act.org/asset/tests/>, 2010).
3. Assessment Technologies Institute (ATI) – a standardized nursing testing package which includes the Test of Essential Academic Skills (TEAS), Self Assessment Inventory (SAI), Proctored/Non-Proctored Content Mastery Series, Critical Thinking Entrance and Exit, and a PN/RN comprehensive predictor designed to predict success on the National Council Licensure Examination for both the RN and the LPN student (<http://www.atitesting.com/Home.aspx>, 2010).
4. Community College Course Descriptions:
 - a) BIO 163 - Basic Anatomy & Physiology - This course provides a basic study of the structure and function of the human body. Topics include a basic study of the body systems as well as an introduction to homeostasis, cells, tissues, nutrition, acid base balance, and electrolytes (<https://www.rccc.edu/catalog/rccc-catalog-2011-2012/>, 2015).
 - b) BIO 168 - Anatomy and Physiology I - This course provides a comprehensive study of the anatomy and physiology of the human body. Topics include body

organization, homeostasis, cytology, histology, and the integumentary, skeletal, muscular, and nervous systems and special senses

(<https://www.rccc.edu/catalog/rccc-catalog-2011-2012/>, 2015).

- c) BIO 169 - Anatomy and Physiology II - This course provides a continuation of the comprehensive study of the anatomy and physiology of the human body.

Topics include the endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary, and reproductive systems as well as metabolism, nutrition, acid base balance, and fluid and electrolyte balance (<https://www.rccc.edu/catalog/rccc-catalog-2011-2012/>, 2015).

- d) ENG 060 - Writing Fundamentals - This course focuses on paragraph structure and development and introduces the formal essay. The course enables students to review and improve grammar, usage, and punctuation skills while employing critical thinking strategies and the writing process to respond to a wide variety of writing situations (<http://www.rccc.edu/catalogs/12-13/eng-060-writing-fundamentals.htm>, 2015).

- e) ENG 070 - Basic Language Skills - This course introduces the fundamentals of standard written English. Emphasis is placed on effective word choice, recognition of sentences and sentence parts, and basic usage. Upon completion, students should be able to generate sentences that clearly express ideas (<http://www.sandhills.edu/programs/usp/ccl/eng.php>, 2015).

- f) ENG 080 - Writing Foundations - This course introduces the writing process and stresses effective sentences. Emphasis is placed on applying the conventions of

written English, reflecting standard usage and mechanics in structuring a variety of sentences (<https://www.rccc.edu/catalog/rccc-catalog-2011-2012/>, 2015).

- g) ENG 090 - Composition Strategies - This course provides practice in the writing process and stresses effective paragraphs. Emphasis is placed on learning and applying conventions of standard written English in developing paragraphs within the essay (<https://www.rccc.edu/catalog/rccc-catalog-2011-2012/>, 2015).
- h) MAT 060 - Essential Mathematics - This course is a comprehensive study of mathematical skills which should provide a strong mathematical foundation to pursue further study. Topics include principles and applications of decimals, fractions, percents, ratio and proportions, order of operations, geometry, measurement, and elements of algebra and statistics
(<https://www.rccc.edu/catalog/rccc-catalog-2008-2010/>, 2015).
- i) MAT 070 - Introductory Algebra - This course establishes a foundation in algebraic concepts and problem solving. Topics include signed numbers, exponents, order of operations, simplifying expressions, solving linear equations and inequalities, graphing, formulas, polynomials, factoring, and elements of geometry (<https://www.rccc.edu/catalog/rccc-catalog-2008-2010/>, 2015).
- j) MAT 080 - Intermediate Algebra - This course continues the study of algebraic concepts with emphasis on applications. Topics include factoring rational expression; rational, radical, and quadratic equations; systems of equations; inequalities; graphing; functions; variations; complex numbers; and elements of geometry (<https://www.rccc.edu/catalog/rccc-catalog-2008-2010/>, 2015).

- k) MAT 090 - Covers some topics of MATH 080 in greater depth. Additional topics include functions, rational expressions, rational exponents, radicals, and quadratic functions. Intended to prepare students for college level mathematics (<http://www.edcc.edu/stem/math/course-descriptions.html>, 2015).
- l) NUR 101 - Practical Nursing I - This course introduces concepts as related to the practical nurse's caregiver and discipline specific roles. Emphasis is placed on the nursing process, legal/ethical/professional issues, wellness/illness patterns, and basic nursing skills. (<https://www.rccc.edu/catalog/rccc-catalog-2008-2010/>, 2015).
- m) NUR 102 - Practical Nursing II - This course includes more advanced concepts as related to the practical nurse's caregiver and discipline-specific roles. Emphasis is placed on the nursing process, delegation, cost effectiveness, legal/ethical/professional issues, and wellness/illness patterns (<https://www.rccc.edu/catalog/rccc-catalog-2008-2010/>, 2015).
- n) NUR 103 - Practical Nursing III - This course focuses on use of nursing/related concepts by practical nurses as provider of care/members of discipline in collaboration with health team members. Emphasis is placed on the nursing process, wellness/illness patterns, entry level issues, accountability, advocacy, professional development, evolving technology, and changing health care delivery systems (<https://www.rccc.edu/catalog/rccc-catalog-2008-2010/>, 2015).

- o) RED 060 - Foundations of Reading - This course focuses on strategies for vocabulary development, improved reading comprehension, and enrichment (<http://www.rccc.edu/catalogs/12-13/rea-060-foundations-of-reading.htm>, 2015).
 - p) RED 070 - Essential Reading Skills - This course is designed to strengthen reading skills. Emphasis is placed on basic word attack skills, vocabulary, transitional words, paragraph organization, basic comprehension skills, and learning strategies (<http://www.beaufortccc.edu/progrm/developmental/assets/documents/red070.pdf>, 2015).
 - q) RED 080 - Introduction to College Reading - This course introduces effective reading and inferential thinking skills in preparation for RED 090. Emphasis is placed on vocabulary, comprehension, and reading strategies (<https://www.rccc.edu/catalog/rccc-catalog-2008-2010/>, 2015).
 - r) RED 090 - Improved College Reading - This course is designed to improve reading and critical thinking skill. Topics include vocabulary enhancement; extracting implied meaning; analyzing the author's purpose, tone, and style; and drawing conclusions and responding to written material (<https://www.rccc.edu/catalog/rccc-catalog-2008-2010/>, 2015).
5. Computer-Adaptive College Placement Test (COMPASS) – a computerized test developed by ACT that measures pre-college student's basic abilities on writing, math, and reading skills (<http://www.act.org/compass/>, 2010).

6. English as a second language (ESL) – those students for whom English is not their primary language
7. Educational Resources Inc (ERI) Exit – a standardized nursing test designed to predict success on the National Council Licensure Exam for the RN and the LPN (<http://www.eriworld.com/>, 2010).
8. Grade Point Average (GPA) – High school grade point average at graduation and grade point average prior to entering the nursing program.
9. Health Educational Systems, Inc (HESI) – a standardized nursing testing package which includes an Admission Assessment, an entrance examination, HESI Exit Examination, and a critical thinking examination (<http://www.hesistudy.com/?gclid=COWTmtue6aQCFYNk7AodPmKY2A>, 2010).
10. Mosby Assess Test – a computer-scored nursing evaluative study tool designed to allow an individual to test his or her knowledge of nursing practice and evaluate his or her ability to apply that knowledge in clinical situations (http://findarticles.com/p/articles/mi_sb6366/is_4_11/ai_n28737554, 2010).
11. National Council Licensure Examination for Practical Nursing (NCLEX-PN) – a standardized written examination which measures knowledge required for providing safe care to patients. Each candidate must achieve a passing score in order to practice (<https://www.ncsbn.org/nclex.htm>, 2010).
12. National Council of State Boards of Nursing (NCSBN) – a body which provides leadership to advance regulatory excellence by assisting member boards, collectively

- and individually, and to promote safe and effective nursing practice in the interest of protecting public health and welfare (<https://www.ncsbn.org/nclex.htm>, 2010).
13. National League for Nursing (NLN) Comprehensive Nursing Achievement Test – a nursing test designed to assess the readiness of a nursing student to take the national council licensure examination for the RN or the LPN student (http://dev.nln.org/testproducts/pas_gradnurse.htm, 2010).
14. Nurse Entrance Exam (NET) - a nursing entrance exam designed to predict overall success in nursing education. It evaluates knowledge of basic mathematics necessary for academic course and clinical practice, determines the speed of reading, and identifies those study skills and learning styles most effective to the students. There is also a writing section which evaluates the level of competence in developing and organizing ideas expressed in a written format (<http://www.pearsonvue.com/net/>, 2010).
15. NCLEX Success – successfully passing the national licensure examination on the first attempt.
16. National League for Nursing (NLN) – a body which provides leadership and accreditation in nursing education (<http://www.nln.org/>, 2010).
17. Persistence/Retention – completion of a nursing program.
18. Practical Nurse or Licensed Practical Nurse – title used in most states for the nurse who has met the requirements for being licensed as a practical nurse.

19. Practical Nursing Entrance Examination (PNEE) – a standardized nursing test which measures academic abilities deemed necessary for success in the course of study (<http://www.test-preparation.ca/nursing/pnee.htm>, 2010).
20. Psychological Services Bureau's Aptitude for Practical Nursing Examination (PSB) – a battery of tests that measure abilities, skills, knowledge, and attitudes important for success performance of students in programs for preparation of practical nurses. The five tests are: 1) General Mental Ability (verbal, numerical, and non-verbal; 2) Spelling; 3) Information in the Natural Sciences; 4) Judgment in Practical Nursing Situations; and 5) Personal Adjustment Index (<http://www.psbttests.com/site/products/apneref.html>, 2010).
21. Scholastic Aptitude Test (SAT) – a test which includes a verbal and math section and is usually administered to high school students in preparation for college entry (<http://sat.collegeboard.com/home>, 2010).
22. Test of Standard Written English (TSWE) – a writing test component of the SAT given prior to 1994 that measures the ability to recognize standard written English (http://openlibrary.org/books/OL4406166M/TSWE_test_of_standard_written_Englis, 2010).

Limitations

1. This study involved collecting data from licensed practical nurses in North Carolina. A list was obtained of all practical nurses who received a license granted by the North Carolina Board of Nursing (NCBON) from 2000-2011.

2. The sample was a convenience sample and therefore does not possess the properties of random sampling.
3. The only contact information provided in the list were mailing addresses. Telephone numbers and email addresses were not available to this researcher.
4. The sample size was small; thus, results may not be generalizable beyond the specific population from which the sample was drawn.
5. There was a lack of more extensive information like actual scores on preadmission testing and GPAs.
6. This was a self-report study, and lack of candor or recollection of facts may not accurately reflect the actual events or opinions held at the time of nursing program enrollment or the taking of the licensure exam.
7. The two criterion variables are measured as nominal variables. Nominal data is the lowest level of measurement and, therefore, requires nonparametric statistical analysis.

Delimitations

1. This study was delimited to only those LPNs who received a practical nursing license from the North Carolina Board of Nursing between the years of 2000 and 2011.
2. Some of the variables researched by Tinto and other nursing studies that will be discussed in the next chapter are not included in this study as this is a post facto study rather than a longitudinal study. Examples of those variables not included would be goal commitment, academic integration, and social integration.

3. The two criterion variables are measured as nominal variables. Nominal data is the lowest level of measurement and, therefore, requires nonparametric statistical analysis.

Summary

The Health Resources and Services Administration reports that all 50 states will suffer from a nursing shortage by 2020 (U.S. Department of Health and Human Services, 2004). This means that there will be a shortage of over one million nurses by 2020 (Kuehn, 2007). Some factors contributing to this crisis are decreasing enrollments in nursing schools, retirement of current nurses, an aging U.S. population that needs nursing services, a shortage of nursing school faculty, expanding career options for women, job burnout, and dissatisfaction (Kurzen, 2005). Keys to being able to work as a licensed practical nurse or as a registered nurse are graduation from an approved nursing program and passing the National Council Licensure Examination. Nursing educators must identify those predictors that will enhance persistence in nursing programs and those that will enhance success of passing the licensure examination so that qualified nurses are not delayed from entering the workforce.

CHAPTER TWO: LITERATURE REVIEW

This literature review provides a brief history of practical nursing and a brief profile of the practical nursing college student in North Carolina followed by a discussion of nursing education research as it relates to predictors of success on the national licensure exam. Finally, a discussion of available research on persistence in nursing programs is reviewed.

History of Practical Nursing

Nursing has evolved over many hundreds of years. Its evolution can be traced as far back as the 1500s. The first school of nursing was established in America in 1849 by the Lutheran Order of Deaconesses under the guidance of Theodor Fliedner, a German pastor in Kaiserwerth, Germany. The first school for training the practical nurse was started in Brooklyn, New York in 1892. It trained its students to care for the chronically ill, invalids, children, and the elderly. The main emphasis was on home care and included cooking, nutrition, basic science, and basic nursing procedures. Graduates of this program were called attendant nurses. Two other practical nursing programs were established in the early 1900s. The increased need for nursing services brought on by World War II resulted in the opening of 260 practical vocational programs between 1948 and 1954 (Christensen & Kockrow, 2006). Practical/Vocational schools continued to grow and as of 2009, 1,119 practical/vocational programs were in existence in the U.S. (National Council of State Boards of Nursing, 2009).

Before 1860, nursing care in the United States was provided generally by people who were self-taught and who gained what experience they could as they practiced their skills. Registration, licensing, and title differentiation were not clear or were nonexistent. Clearly

defined duties and responsibilities were absent. The U.S. Department of Vocational Education commissioned an intensive study of practical/vocational nursing tasks in 1944. As a result of this study, individual state boards of nursing began to specify the duties and responsibilities that could be carried out by the registered nurse and the practical/vocational nurse (Christensen & Kockrow, 2006). Most nurse practice acts are similar across the United States, but there is variation in how the States express the details of the work of practical nurses. Most states are flexible and do not specify the tasks that practical nurses can perform, but there are some states that are very restrictive in the tasks that can be performed by this group of nurses.

Seago, Spetz, Chapman, Dyer, & Grumbach (2004) report that “there is little in the literature about the practice, work, demand for, or efficient utilization of the licensed practical nurse. There also is little guidance about how to make effective use of these practitioner’s skills to enhance patient care and augment the nurse workforce” (p.3). These same authors report that they were only able to uncover one national survey of licensed practical nurses conducted in 1983; thus, little is known about the practical nursing workforce in the United States, and the data that is available is conflicting.

The study by Seago et al. (2004), reports that hospitals are the dominant employer for licensed nurses; however, RNs are more likely to work in hospitals than are LPNs. A large number of LPNs work in long-term care facilities. Li and Kenward (2006) report that 51.8% of LPNs work in long-term care, 17.5% in community or ambulatory settings, and 25% in hospitals.

Despite this trend, Seago et al. (2004) contend that nursing directors in hospitals report increasing LPN employment in all types of patient units primarily due to shortages of RNs. This is an attractive hiring option because LPNs cost less to employ than RNs and they can perform higher level skills than nurse aids. LPNs have been historically a necessary part of the healthcare workforce. As the U.S. population ages, the demands for nursing care and the age of the current nursing workforce increase as well.

Profile of the North Carolina Practical Nursing Student

The North Carolina Board of Nursing (2010a) reported trends in nursing education from 2004-2009. The 2009 statistics reported that females were more prevalent in practical nursing programs at 92.4% versus the male population of 7.4%. The most prevalent age group of practical nursing students was between 31 and 40 years of age. Approximately 61% of the students reported they were White, 32% reported being Black, 2% reported being Asian or a Pacific Islander, 2% reported being Hispanic, 2% reported being an American Indian or an Alaska native, and 1% reported being multiracial. The total number of minority students in practical nursing programs in North Carolina has increased from 13% in 2004 to 16% in 2009. There were 1,399 practical nursing students enrolled in 2009. The on-time graduation rate was 68% (North Carolina Board of Nursing, 2010b). The national NCLEX-PN pass rate for 2009 was 86%. The North Carolina NCLEX-PN pass rate for 2009 was 95% (North Carolina Board of Nursing, 2010c).

Review of Nursing Education Research on NCLEX Success

A review of the literature uncovered 47 studies that sought to identify predictor variables of the likelihood of success on the NCLEX. Ten of those studies involved only

practical nursing students and four of the studies involved both practical nursing students and associate degree students. Nineteen studies involved only associate degree nursing students. Thirteen studies involved only baccalaureate nursing students, and one study involved both associate degree students and baccalaureate degree students. Studies on practical nursing students comprise approximately 30% of this research; however, according to Seago et al. (2004), based on data related to gender, age, marital status, and ethnicity, LPNs and RNs come from essentially the same pool of potential workers. Conversely, Lamm and McDaniel (2000) and Ostrye (2001) caution against generalizing from RN students to LPN students. They reported that PN students are drawn from a different pool rather than RN students and require their own focused research.

The first published study involving practical nursing students was in 1989 with the most recent published in 2008. Most of the studies used available data from the 1990s with only a couple of studies using data from the year 2000. There have not been any studies published using practical nursing data later than 2000 that this researcher was able to uncover.

Thirty nine of the 47 studies used convenience samples, and most were limited to using students from a specific institution or a specific state. Three of the studies did use a national sample. Sample sizes ranged from 8 to 6800. None of the studies used exactly the same variables to determine the likelihood of success on the NCLEX, but most used a combination of demographic and academic variables such as age, gender, race, income, pre-college or pre-nursing GPA, cumulative GPA, science grades, method of high school completion, use of financial aid, and high school rank/GPA. Eight of the studies used a

standardized pre-nursing test to predict NCLEX success, and 21 of the studies used a standardized test at the end of the nursing program (exit exams) to predict the likelihood of NCLEX success. There are many different standardized tests used by nursing programs to predict NCLEX success, but the two most common standardized tests used were the Mosby Assess Test and the HESI exit exam. Both of these tests are administered at the end of the nursing program and are designed to predict the likelihood of success on the NCLEX if the NCLEX were taken at that same time rather than the exit exams.

The statistical methods used in these studies varied; thus, the reporting of the significant predictor variable values varied. None of the studies reported an effect size. There were six studies that reported the amount of variance from which independent variables explained the criterion variable (Dickey, 1989; Foti & DeYoung, 1991; Fowler & McAfee, 1991; Hereford, 2005; Pangle, 1992; Thompson, 1989). None of the studies found the same set of variables to be significant. Following is a report of the most common significant variables reported to impact NCLEX success.

GPA. GPA was the variable identified by most of the studies as being likely to predict success on the NCLEX. Overall college GPA was found to be of significance in five studies (Arathuzik & Aber, 1998; Foti & DeYoung, 1991; Humphreys, 2008; Lamm & McDaniel, 2000; Waterhouse et al., 1993). Nursing GPA was found to be a significant predictor of NCLEX success in six studies (Drake, 1994; Fowles, 1992; Haas, Nugent, & Rule, 2004; Hawsey, 1997; Ostrye, 2001; Wall, Miller & Widerquist, 1993). Pre-nursing GPA was found to be a predictor of NCLEX success in four studies (Hereford, 2005; Wall et al., 1993; Yin, 2003; Young-Richardson, 1996). Sayles, Shelton & Powell (2003) found the

GPA of courses taken toward the nursing degree to be a significant predictor of NCLEX success. Hawsey (1997), Hereford (2005), and Humphreys (2008), identified 3.0 or greater as being the GPA that was most likely to predict success. Nursing course grades rather than GPA were found to be significant in four studies (Alexander & Brophy, 1997; Drake, 1994; Gallagher, Bomba, & Crane, 2001; Pangle, 1992).

Ethnicity. Race was another variable identified as likely to predict success on the NCLEX (Briscoe & Anema, 1999; Dickey, 1989; Haas et al., 2004; Hawsey, 1997; Hereford, 2005; Parrish, 1994; Sayles et al., 2003; Thompson, 1989). All studies revealed that White students were more likely to be successful on the exam than Black students.

SAT. A third variable identified as likely to predict success on the NCLEX was the verbal portion of the SAT (Alexander & Brophy, 1997; Dickey, 1989; Foti & DeYoung, 1991; Fowler & McAfee, 1991; Haas et al., 2004; Thompson, 1989; Waterhouse et al., 1994). Composite SAT scores were found to be significant predictor variables by Dickey (1989) and Fowler & McAfee (1991).

Age and standardized testing. Other significant variables identified as likely to predict success on the NCLEX were age and the use of a standardized test. Age was found to be a predictor variable by (Briscoe & Anema, 1999; Dickey, 1989; Humphreys, 2008; Parrish, 1994; Thompson, 1989). All of the studies reported that the older the student, the more likely the success on the NCLEX.

The most common standardized tests studied were either the National League for Nursing (NLN) Comprehensive Achievement Test (Alexander & Brophy, 1997; Briscoe & Anema, 1999; Pangle, 1992; Wall et al., 1993; Young-Richardson, 1996) or the Health

Educational Systems, Inc (HESI), (Humphreys, 2008; Lauchner, Newman, & Britt, 2005; Morrison, Free, & Newman, 2002; Nibert & Young, 2001; Nibert, Young, & Adamson, 2008). The Mosby Assess Test was found to be a significant predictor in two studies (Foti & DeYoung, 1991; Fowles, 1992). Humphreys (2008) found the Assessment Technologies Institute (ATI) standardized test to be a predictor of NCLEX success. The Nurse Entrance Test (NET) and the Educational Resources Inc (ERI) exit exams were found to be significant variables in one study (Sayles et al., 2003), and the Practical Nursing Entrance Examination (PNEE) was found to be a significant variable in one study (Young-Richardson, 1996). The Test of Standard Written English (TSWE) was found to be a predictor of success in two studies (Dickey, 1989; Fowler & McAfee, 1991). Crow, Handley, Morrison, and Shelton (2004) identified entrance tests and exit tests to be significant predictors of success but gave no names for the tests. They also identified having a review course after all of the nursing program content was covered as being a significant predictor of NCLEX success. Definitions for the above standardized tests are provided in Chapter 1.

Extraneous significant variables of NCLEX success. Other academic variables found to be significant predictors of NCLEX success were obtaining a GED versus graduation from high school (Hereford, 2005), high school rank (Wall et al., 1993; Yin, 2003), grades in science courses (Fowles, 1992; Wall et al., 1993; Waterhouse et al., 1994; Yin, 2003), the science portion of the Psychological Services Bureau's Aptitude for Practical Nursing Examination (PSB), (Dickey, 1989; Ostrye, 2001), reading scores (Hawsey, 1997; Hereford, 2005; Ostrye, 2000), career placement reading scores (Thompson, 1989), instruction in test taking, the creation of learning teams, and faculty follow-up (Frierson,

Malone, & Shelton, 1993), sense of test taking ability (Arathuzik & Aber, 1998), and critical thinking (Giddens & Gloeckner, 2005).

Other non-academic or demographic variables found to be significant predictors of NCLEX success were, being married rather than being single (Dickey, 1989), mental ability as measured by the PSB (Fowler & McAfee, 1991; Lamm & McDaniel, 2000), personal adjustment as measured by the PSB (Fowler & McAfee, 1991), and judgment as measured by the PSB (Dickey, 1989; Lamm & McDaniel, 2000). Grzegorczyk (1994) found that those students having previous acute care experience was a predictor of NCLEX success.

Some non-academic or demographic variables were identified as predictors of NCLEX success but with negative correlations. The amount of time from graduation until students actually take the NCLEX was a predictor (Woo, Wendt, & Liu, 2009). Family demands, emotional status, and English as a second language were found to be predictors (Arathuzik & Aber, 1998). The presence of a class/clinical attendance policy and number of times the student repeated the program were also identified as predictors of success (Turner, 2005). In other words, students who wait longer to take the NCLEX after graduation and students for whom English is a second language were less likely to be successful on the exam. Those students experiencing greater family demands and those who repeated the program more than once were also less likely to be successful on the exam. Turner (2005) also found that having an attendance policy in place for clinical and class time was a predictor of success on the exam because students had fewer absences and thus were present more often for learning to occur. Arathuzik & Aber (1998) also found that students scoring

lower on the internal stressors of emotion, anxiety, anger, guilt, and loneliness were more successful on the NCLEX.

Persistence in Higher Education and in Nursing Programs

Persistence in higher education as well as in nursing programs overall has been a topic of interest for decades. Pantages and Creedon (1978) conducted a literature review from 1950-1975 on college attrition. They reported at that time that four of every ten students who entered college would graduate four years later. Tinto (1993) reported that almost one half of students entering 2-year colleges and more than one fourth of students entering 4-year colleges depart at the end of their first year. According to Brawer (1996) approximately 50% of freshmen enrolled in college drop out before completing their program. The U.S. Department of Education (1998) reported that nearly 30% of beginning students in 1989-1990 dropped out before the beginning of their second year.

The news regarding persistence just gets bleaker. According to a 2004 report by the U.S. Dept of Education, trends in college completion indicate that overall attainment rates have changed little since the early 70s. Tinto and Pusser (2006) report that as of 2005, student persistence rates have not changed very much since the 1980s. According to Tinto and Pusser (2006) approximately six out of ten students do not complete either a 2-year or 4-year degree, and only slightly more than 50% of 4-year degree seekers persist.

Rowland (1978) reported that 44% of all nursing students in baccalaureate degree programs failed to complete the program. Feldbaum and Levitt (1980) found the mean attrition rates for baccalaureate degree programs to be 15.9% and that a higher portion of Black students left the program. Rosenfeld (1987) found retention rates to be 87% in

associate degree programs and 76% in baccalaureate degree programs. Campbell and Dickson (1996) conducted a ten year review from 1981 through 1990 of research related to nursing student success and concluded, “The findings of this study indicate the continued inability of nursing research to consistently identify student characteristics predictive of successful retention, graduation, or NCLEX success” (p. 57). They posit that a major challenge for nurse educators today will be to produce a steady flow of nurses to meet the increasing health care needs of our society. Wells (2003) concurs and says, “The retention of students in nursing programs continues to be a major challenge for nurse educators and deans of nursing programs. Student attrition negatively impacts the needed supply of registered nurses to fill staff, administrative, and teaching positions” (p. 230).

A review of the higher education persistence literature proved lucrative; however, the nursing program persistence literature only uncovered eight studies and four literature reviews that attempted to identify those factors that likely lead to program persistence. Most of the studies used convenience samples from one institution. Four of the literature reviews were on registered nursing students, and five studies were on registered nursing students. Three studies were on practical nursing students. This body of research covers the years of 1978 through 2010.

Studies on practical nursing student persistence comprise approximately 25% of this research; however, according to Seago et al. (2004), based on data related to gender, age, marital status, and ethnicity, LPNs and RNs come from essentially the same pool of potential workers. It must be reported, though, that some authors (Lamm & McDaniel, 2000; Ostrye, 2001) caution against generalizing from RN students to LPN students. Because of the

paucity of literature regarding practical nursing persistence, results will be reported on all of the nursing studies uncovered in the literature review.

Statistically significant variable of nursing program persistence. The variables studied in this body of research regarding nursing program persistence were consistent with those variables Tinto (1975) deemed important to include such as individual characteristics, family characteristics, educational experiences and educational expectation. Overall college GPA was found to be significant by Campbell and Dickson (1996). Nursing GPA was found to be a significant predictor of persistence in two studies (Campbell & Dickson, 1996; Sayles et al., 2003). Science grades or science GPA was found to be significant by Campbell & Dickson (1996).

High school performance measured either as GPA or rank was found to be a significant predictor of nursing program persistence in two studies (Porter, 2008; Sayles et al., 2003). Maville & Huerta (1997) found in a study of associate degree nursing students that age and ethnicity were significant predictors of persistence. Specifically older and non-Hispanic students were more successful. Though significant, these two variables only explained 3.1% of the variance on the dependent variable. Shelton (2003) found in a study of associate degree nursing students that persisters had higher perceived levels of faculty support. Stickney (2008) found in a study of practical nursing students that the math, verbal, and reading scores of the Test of Adult Basic Education to be significant for persisters. Stickney (2008) also found White students were more successful in the program than non-White students. Early Pritchard (2010) found pre-admission Compass reading scores to be a significant factor on PN student completers. Other academic variables found to be

significant predictors of college persistence were SAT scores and ACT scores (Campbell & Dickson, 1996; Porter, 2008; Rogers, 2010).

Two themes emerge from the retention literature for nursing students and for current working nurses. They are age and cultural diversity. Wells (2007) reports that according to the American Association of Colleges of Nursing (AACN) in 2003, the population of registered nurses under the age of 30 declined from 25.1% to 9.1% in 2000 with the average age of nurses in 2000 being 43.3 years. She further reports that the AACN cites an aging nursing workforce as a significant contributor of the nursing shortage (Wells, 2007).

Wells (2003) states that according to the 2002 report of the AACN, enrollment data of 2001 and graduation data from 2001-2002 show that of students enrolled in generic registered nurse programs, 73% were White students, 11.4% were Black students, 5.7% were Hispanic students, 5% were Asian students, and 0.6% were Native Americans. Graduation data show that Whites graduated at a 76% rate, Black at 9.4%, Hispanics at 5.3%, Asians at 4.9%, and Native Americans at 0.6%. Gardner (2005) posits that the lack of minority nurses in the working profession is the result of increased minority student drop-out from nursing programs.

Wells (2003) goes on to report from the U.S. Department of Health and Human Services in 2001, that Whites comprise 69% of the U.S. population but comprise 87% of the registered nurse population, Hispanics comprise almost 13% of the U.S. population but only 2% of registered nurse population, and that Blacks comprise 12% of the U.S. population but only about 5% of the registered nurse population. The AACN (2001) calls for the increase in the number of minority nurses if the profession is to keep pace with the changing

demographics of this nation. This same urging was present in the 90s as Jordan (1996) called for nursing schools to recruit and retain students reflecting the health care needs of a more diverse nation.

Gardner (2005) reports from the U.S. Census Bureau (2000) and U.S. Department of Health and Human Service (2001) that approximately 31% of people in the U.S. identified themselves as being a racial or ethnic minority in 2000, but only 12.3% of registered nurses identified themselves as such. The U.S. Census Bureau projects the number of American minorities to rise by 50% by the year 2020.

Wells (2003) states:

The consequences of student attrition are realized by the student, the college of nursing, and the nursing profession. For the student there is the psychological effect of failure and its potential impact on self-confidence, and the financial consequence of early repayment of student loans. In addition to dwindling financial resources, institutions realize further financial consequences of student attrition in terms of lost tuition dollars. (p. 231)

Wells (2003) goes on to say, “The consequences of student attrition for the nursing profession are realized in the lack of available nurses to meet the health care needs of society and in fewer nurses to fill leadership positions” (p. 231). Wells also says that much of the research on nursing students was done in the 70s and 80s when the typical student was White, middle class, and entering nursing education programs after graduating from high school. Sheffler (1997) reports the nursing student of the 90s tends to be older, likely lives off campus, and likely has a previous college degree or at least some college experience.

Summary

According to the AACN (2010), the United States is projected to have a nursing shortage that is expected to intensify as baby boomers age and the need for health care grows. Compounding the problem is that faculty shortages across the country are limiting student capacity at a time when the need for nurses continues to grow. The need for nursing program persistence and first time success on the national nursing exam would help lessen this burden. The intent of this study was to identify those variables that predict persistence in practical nursing programs and NCLEX-PN success.

This study used an ex post facto design rather than a longitudinal design. Consequently some of the variables found to be significant in the literature review were not included in this study. Some of the variables that were not included are faculty support, specific nursing program policies, academic integration, and goal commitment. Some of the variables are not generally required by community colleges such as SAT or ACT scores; thus, these variables were not included in this study. The use of standardized testing varies from program to program as well as from year to year as testing companies are bought or sold or nursing programs choose another type of test to use; thus, standardized testing was not included in this study.

CHAPTER 3: METHODOLOGY

This chapter presents a description of the methods that were used to conduct this research study. An introduction to the study is presented followed by the research design. Detailed sections discuss the research variables, the population/sample, instrumentation, method of data collection, and methods of data analysis. Finally a summary of this section is presented.

Introduction

Developing predictive criteria for persistence in nursing programs and then being successful on the NCLEX-PN is an important consideration for nursing programs because it involves high stakes for both students and nursing programs (Spurlock & Hanks, 2004). State Boards of Nursing hold nursing programs accountable in large part by their graduated student scores on the NCLEX (Arathuzik & Aber, 1998). The current nursing shortage increases the need for success on the first attempt so the graduates can quickly enter the workforce (Seldomridge & DiBartolo, 2004).

Research Design

Research design is the plan used to obtain answers to research questions (Kerlinger & Lee, 2000). Research designs can be experimental or nonexperimental. An experimental design is one in which the investigator manipulates at least one of the independent variables (Kerlinger & Lee, 2000). In nonexperimental research the investigator cannot manipulate the variables (Kerlinger & Lee, 2000). The research design used in this study was nonexperimental. Sproull (1995) defines a nonexperimental design as “a research design in which an experimental variable is not introduced by the researcher but measures can be

taken” (p. 153). Kerlinger and Lee (2000) define the nonexperimental design as “systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relations among variables are made, without direct intervention” (p. 558).

According to Kerlinger and Lee (2000) in some fields such as psychology and education, the nonexperimental design is unavoidable as with students who come to the researcher with unchangeable characteristics such as age and gender. Nonexperimental research is just as valuable as experimental research (Sproull, 1995). The main difference in nonexperimental versus experimental research is that in nonexperimental research the researcher is unable to manipulate or experiment with the variables but is able to impose measures of the variables (Sproull, 1995). Descriptive analysis was used to describe the characteristics of the population. Correlation and Logistic Regression analyses were used to identify which variables predicted persistence in nursing programs and success on the national nursing licensure exam. Specific details regarding these analysis techniques are discussed in the data analysis section of this chapter.

Research Variables

This research study used self-report data from licensed practical nurses in North Carolina who were granted a license by the North Carolina Board of Nursing in the years 2000-2011. The predictor variables were a combination of demographic/non-academic characteristics (age at program admission, gender, individual and parental ethnicity, individual and parental income at program admission, parental education level, marital status

during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational aid, method of high school completion) and academic characteristics (high school rank, high school GPA, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, final college GPA). The two dependent variables were persistence in the practical nursing program and first time success on the NCLEX-PN.

Variables were recorded as nominal, ordinal, interval, or ratio level data. Nominal data had a binary outcome where data placement was in one of two categories. Ordinal data included outcomes where data placement had a natural order but had undefined interval distances. Interval and ratio data were recorded as actual numerical data.

Nominal variables included gender, individual and parental ethnicity, method of high school completion, parental education level, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, receipt of monetary educational aid, college admission testing, completion of remedial courses, nursing program admission testing, completion of anatomy and physiology courses, and nursing program exit exam/remediation offerings.

Ordinal variables included high school GPA, pre-nursing college GPA, remedial course grades, anatomy and physiology course grades, individual nursing course grades, and

final college GPA. High school rank was recorded as interval data. Age at program admission, individual and parental income at program admission, and number of hours worked per week during nursing program enrollment were recorded as ratio data.

Gender was coded as 0 for male and 1 for female. Ethnicity for the respondents as well as for each parent was initially coded as 1 for White, 2 for Black, 3 for Hispanic, 4 for Asian, 5 for American Indian, or 6 for other. Ethnicity was later recoded as 0 for minority and 1 for nonminority. Marital status was initially coded as 1 for single, 2 for living with a partner, 3 for married, 4 for separated, 5 for divorced, 6 for widowed, or 7 for other. Marital status was later recoded as 0 for single and 1 for non-single.

The method of high school completion was coded as 0 for GED and 1 for HS diploma. High school rank was coded as 3 for top 1/3 of class, 2 for middle 1/3 of class, and 1 for lower 1/3 of class. High school GPA was coded as 5 for A, 4 for B, 3 for C, 2 for D, and 1 for below D. ESL was coded as 0 for English as a second language and 1 for non ESL. Language spoken in the childhood home was coded as 3 for English, 2 for English plus any other language, and 1 for non-English. Parental educational level was collected for both mother and father. Originally the educational level for each was recorded in varying levels from 1-10 but was later recoded as 0 for no college degree and 1 for college degree. Receipt of monetary educational assistance/aid was broken down into five categories. Scholarship assistance/aid, financial assistance/aid, family assistance/aid, employer assistance/aid, and student loan assistance/aid were all coded as 0 for no aid and 1 for aid.

The presence of children in the home during nursing program enrollment was coded as 0 for no children present and 1 for children present. College admission testing was coded

as 0 for no college admission testing and 1 for college admission testing. Pre-nursing college GPA was coded as 0 for not applicable, 1 for D, 2 for C, 3 for B and 4 for A. Completion of remedial courses was coded as 0 for no remedial course and 1 for remedial course. Each of the 12 remedial courses was coded separately. Remedial course grades were coded as 0 for not applicable, 1 for C, 2 for B, and 3 for A. Nursing program admission testing was coded as 0 for not applicable/don't remember, 1 for no testing required, and 2 for testing required. Completion of anatomy and physiology courses (BIO 163, BIO 168, BIO 169, and BIO other transferred) were coded as 0 for no anatomy course taken and 1 for yes the course was taken. Grades were coded as 0 for not applicable, 1 for C, 2 for B, and 3 for A. Individual nursing courses (NUR 101, NUR 102, NUR 103) were coded as 1 for C, 2 for B, and 3 for A. Nursing program exit exam was coded as 0 for no exit exam required and 1 for exit exam was required. Remediation for nursing exit exam was coded as 1 for not applicable, 2 for none offered and 3 for remediation offered. Final college GPA was coded as 1 for D, 2 for C, 3 for B, and 4 for A.

Age was initially coded as reported and was later coded as 1 for 17-21 years, 2 for 22-29 years, 3 for 30-39 years, 4 for 40-49 years, and 5 for 50 plus years. Annual individual and combined parental income were both coded as 1 for \$10,000 or less, 2 for \$10,001 to \$20,000, 3 for \$20,001 to \$35,000, 4 for \$35,001 to \$50,000, 5 for \$50,001 to \$100,000, and 6 for \$100,001 and above. The number of hours worked during nursing program enrollment was recorded as 0 for no hours worked, 1 for 1-16 hours worked, 2 for 17-23 hours worked, 3 for 24-31 hours worked, and 4 for 32-50 hours worked.

Nursing Program Persistence was coded as 0 for non-persistence and 1 for persistence. NCLEX-PN results were coded as 0 for did not pass NCLEX-PN and 1 for did pass NCLEX-PN. Appendix A displays the coding and level of data for the variables included as demographic and non-academic characteristics. Appendix B displays the coding and level of data for academic characteristics. Appendix C displays the coding and level of data for nursing program persistence and the NCLEX-PN, which are the dependent variables.

Population

The population for this study included all licensed practical nurses that had been granted a license to practice in North Carolina by the NCBON. It was not feasible due to time and monetary constraints to study this entire population. A convenience sample would be quicker and cheaper; thus, a list was obtained from the NCBON in the spring of 2012 which contained 11,440 names. The practical nurses on this list were granted licenses to practice in the state of NC by the NCBON in the years 2000-2011. This researcher did not have access to where and when these licensed practical nurses obtained their original nursing license, so it must be understood that the final sample could be comprised of practical nurses that received their original practical nursing license in a state other than North Carolina and in a year earlier than 2000. Though this list was a sample of the entire population, the list was still too large to feasibly study; thus, a sample of 1000 names was obtained using a random sampling technique. Using a random sampling technique helps to promote a representative sample that is unbiased and in which results can be more accurately generalized to the population.

A postcard explaining the purpose of the study along with a request to answer an online practical nursing education survey housed on surveymonkey.com was sent to the 1,000 randomly selected licensed practical nurses from the NCBON list. A reminder post card was sent to these 1000 practical nurses one and two months following the first postcard with a total of 25 responses received.

In an effort to increase sample size, a post card explaining the purpose of the study along with a request to answer an online practical nursing education survey housed on surveymonkey.com was sent to an additional set of 1,000 randomly selected licensed practical nurses from the remaining 10,440 names. Thirty additional responses were received bringing the total of responses to fifty-five or 2.75%.

In an effort to increase the response rate, a paper copy of the online survey, a cover letter explaining the purpose of the study containing a request to answer the survey either online or on paper, along with a self-addressed stamped return envelope was sent to an additional 1,233 randomly selected practical nurses from the remaining 9,440 names. Ninety eight responses were received, bringing the total of responses to 153 or 4.75%. The response rate for the online request was 2.75% versus 7.9% for the paper survey. There were 364 post cards or surveys returned (11.26%) as undeliverable by the United States Postal Service.

Instrument

According to Sproull (1995), “An instrument is whatever device is used to measure variables and can range from written or oral materials to physical devices” (p.179). Some examples of instrumentation include questionnaires, rating scales, skills tests, checklists, and materials created by the researcher (Sproull, 1995).

A structured form adapted by the researcher was used to create a list of survey questions. The original form was created by Dickey (1989) and was later adapted by Fowler and McAfee (1991). Dickey established face and content validity, and Fowler and McAfee had the tool evaluated by faculty expert for validity. A copy of the structured form and the survey questionnaire used can be found in Appendices D and E respectively.

Data Collection

A data collection method is the means by which information about variables is collected (Sproull, 1995). There are four different data collection methods including interviewing, instrument administration, observation, and examination of documents, materials, and artifacts (Sproull, 1995). The data for all of the independent and dependent variables in this study was collected from instrument administration, which was a survey questionnaire. A copy of this questionnaire can be found in Appendix E.

Pre-Data Analysis

The tasks involved in examining data may seem mundane and inconsequential, but they are an essential part of any analysis (Hair, Black, Babin, Anderson, & Tatham, 2006). Analysis of data allows the researcher to understand, interpret, and articulate results based on relationships (Hair et al., 2006).

Hair, Black, Babin, Anderson, & Tatham (2006) state the following:

Data examination is a time-consuming, but necessary, initial step in any analysis that researchers often overlook. Here the researcher evaluates the impact of missing data, identifies outliers, and tests for the assumptions underlying most multivariate

techniques. Violations of the statistical assumption may cause biases or non-significance in the results that cannot be distinguished from the true results. (p. 37)

Data for this study was examined using a variety of techniques to ensure assumptions were met for the use of multivariate data analysis. Missing data or outliers were addressed using appropriate techniques. The techniques used to accommodate missing data depend on the types of missing data, the amount of missing data, and if the missing data are known or unknown. The techniques used to accommodate outliers depend on the influence the outlier has on the results (Hair et al., 2006).

Normality, homoscedasticity, linearity, and the absence of correlated errors are basic assumptions underlying multivariate analysis. If any of these assumptions are violated, the research results may be flawed. There are, however, a number of data remedies available to the researcher to assist in meeting these basic multivariate assumptions.

Data Analysis by Research Question

The purpose of this study was to examine those variables that predict practical nursing program persistence and success on the NCLEX-PN. The research questions identified are:

Research Question 1. What is the relationship between the variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of

hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) and practical nursing program persistence/retention?

Research Question 2. What is the relationship between the variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades , nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) and NCLEX-PN success?

Research Question 3. What set of variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school

completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) provided the best prediction of practical nursing program persistence/retention?

Research Question 4. What set of variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit

exam/remediation offerings, and final college GPA) provided the best prediction of NCLEX-PN success?

Sproull (1995) suggests that correlation is a data analysis technique used frequently for nonexperimental designs. Sproull further states that “correlational analyses are very useful and widely used for prediction. With a sufficient amount of evidence, a high correlation between two variables indicates that one variable can be used to predict the other variable (within a range of error)” (p. 154). Sproull cautions though that a high correlation does not indicate causation.

SPSS (version 22.0) was the statistical program used to analyze data for this research study. SPSS is a comprehensive system and can take data from almost any type of file and use them to generate tabulated reports, charts, and plots of distributions and trends, descriptive statistics, and complex statistical analyses. Simple menus and dialog box selection make it possible to perform complex analyses without typing a single line of command syntax. SPSS provides techniques for analyzing data that do not fit traditional linear statistical models like logistic regression (SPSS, 2013).

To answer research questions 1 and 2, correlation analysis was used to determine the association between each independent variable and nursing program persistence and NCLEX-PN results. Appropriate correlation tests were applied as determined by the variable scales of measurement. A Phi coefficient analysis was used to determine the association between nominal independent variables such as gender and the nominal dependent variables of nursing program persistence and NCLEX-PN results. A Phi coefficient is appropriate when variables are assessed using nominal scales of measurement (Miller, 1998).

A point-biserial analysis was used to determine the association between the interval and ratio independent variables such as age and the dependent variables of nursing program persistence and NCLEX-PN results. The point-biserial correlation is a special case of the Pearson product-moment correlation, but a criterion for the Pearson correlation is that both variables be measured on an interval or ratio level. The nominal categories of the dependent variables do not meet this criterion. A point-biserial analysis is appropriate when one variable is continuous such as age and the other variable is nominal (Miller, 1998). Significance for the analyses was established at the 0.05 level of confidence.

To answer research questions 3 and 4, a logistic analysis technique was used in this study as there are multiple independent variables and there is a need to determine the relationship between those variables and a dependent variable. Logistic regression is a specialized form of regression that is formulated to predict and explain a categorical variable (Hair et al., 2006). Logistic regression is appropriate because the variables being studied are nominal in nature (Kerlinger & Lee, 2000; Miller, 1998). Specifically, binary logistic regression analysis was used on those variables found to have a significant association with either the Phi coefficient or the point-biserial analyses. Binary logistic regression is an appropriate analysis technique to use as there are two dependent variables (Hair et al., 2006).

Logistic regression is similar to multiple regression but is not held to the same assumptions. The binary nature of a categorical dependent variable violates the normal distribution as it is a binomial distribution. In addition, the variance of a dichotomous variable is not constant; creating instances of heteroscedasticity and transformations of the

variables will not remedy the situation, but logistic regression was developed to deal with these issues (Hair et al., 2006).

According to Peng, Lee, & Ingersoll (2002) "The central mathematical concept that underlies logistic regression is the logit - the natural logarithm of an odds ratio" (p. 3). According to Burns and Burns (2009) "Logits are b coefficients (slope values) of the regression equation. The slope can be interpreted as the change in the average value of Y, from one unit of change in X" (p. 573). These authors further explain that the statistical test measured in logistic regression is the Wald statistic, which is similar to the t test used in multiple regression. The larger the Wald statistic, the greater the uniqueness of the predictor in the equation. Hair et al. (2006) state that "in making an assessment of the overall fit of a logistic regression model, we can draw upon three approaches: statistical measures of overall model fit, pseudo R² measures and classification accuracy as expressed in the hit ratio" (p. 372).

According to Hair et al. (2006), the first statistical measure called the Omnibus Test of Model Coefficients, which calculates a chi-square value, is used to see if there is a change in the log likelihood value (-2LL) which is comparable to the overall F test in multiple regression and is a test of the significance of the difference between the likelihood ratio for the researcher's model with predictors minus the likelihood ratio for the baseline model with only a constant in it. Probabilities are less than one, so log likelihood values are always negative and noted as -2LL. Smaller values of the -2LL measure indicate better model fit.

The second statistical measure to assess accordingly is the Hosmer and Lemeshow measure of overall fit. This statistical test measures the correspondence of the actual and

predicted values of the dependent variable. It tests the null hypothesis that the base model is a good enough fit for the data. The better model fit is indicated by a smaller difference in the observed and predicted classification. A non-significant value indicates that the new model fit is more acceptable than the base model.

The Cox & Snell R² and the Nagelkerke R² are two methods of calculating explained variance in the dependent variable. These values are sometimes referred to as pseudo R² values as they are not truly R² estimates as seen in standard multiple regression and do not represent the amount of variance accounted for by all the predictor variables. The larger the Cox & Snell value the better the model, and it is calculated such that it can be greater than one. The Nagelkerke estimate is calculated in such a way that it is constrained between 0 and 1. The closer to 1, the better the model fit.

The third examination of overall model fit according to Hair et al. (2006) is to assess the classification accuracy. This is how well the full model with the predictor variables correctly classifies cases into one of the two binary outcomes versus a classification based just on chance.

Summary

Developing predictive criteria for persistence in practical nursing programs and then being successful on the NCLEX-PN is an important consideration for practical nursing programs because it involves high stakes for both students and nursing programs (Spurlock & Hanks, 2004). State Boards of Nursing hold nursing programs accountable in large part by their graduated student scores on the NCLEX (Arathuzik & Aber, 1998). The current

nursing shortage increases the need for success on the first attempt so the graduates can quickly enter the workforce (Seldomridge & DiBartolo, 2004).

This study used self-report data from licensed practical nurses in North Carolina. None of the variables were manipulated, making this a nonexperimental study. Sproull (1995) defines a nonexperimental design as “a research design in which an experimental variable is not introduced by the researcher but measures can be taken” (p. 153). Kerlinger and Lee (2000) define the nonexperimental design as “systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relations among variables are made, without direct intervention” (p. 558).

According to Kerlinger and Lee (2000) in some fields such as psychology and education, the nonexperimental design is unavoidable, such as with students who come to the researcher with unchangeable characteristics such as age and gender. Nonexperimental research is just as valuable as experimental research. The main difference in nonexperimental research is that the researcher is unable to manipulate or experiment with the variables but is able to impose measures of the variables (Sproull, 1995). Descriptive analysis was used to describe the characteristics of the population. Correlation and logistic regression analyses were used to identify which variables predict persistence in nursing programs and success on the national nursing licensure exam.

CHAPTER 4: FINDINGS

This study was conducted to examine those variables that may assist in predicting persistence in licensed practical nursing programs as well as those variables that may assist in predicting first time success on the practical nursing licensure exam. The study addresses the specific questions:

1. What is the relationship between the variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) and practical nursing program persistence/retention?

2. What is the relationship between the variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of

children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades , nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) and NCLEX-PN success?

3. What set of variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) provided the best prediction of practical nursing program persistence/retention?

4. What set of variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) provided the best prediction of NCLEX-PN success?

Study Population

The study sample consisted of 153 licensed practical nurses who had obtained a license to practice in the state of North Carolina between the years of 2000 and 2011. A list of all licensed practical nurses who were issued a practical nursing license between the years of 2000 and 2011 was obtained from the North Carolina Board of Nursing. The list contained 11,440 names. This researcher did not have access to where and when these licensed practical nurses obtained their original nursing license, so it must be understood that the final sample could be comprised of practical nurses that received their original license in a state other than North Carolina and in a year earlier than 2000. The researcher did not have access to telephone numbers or email addresses; thus, communication occurred entirely via the postal service system.

A postcard explaining the purpose of the study along with a request to answer an online practical nursing education survey housed on surveymonkey.com was sent to 1,000 randomly selected licensed practical nurses from the NCBON list. A reminder postcard was sent to these 1000 practical nurses one and two months following the first postcard with a total of 25 responses received. This was a response rate of 2.5%. A postcard explaining the purpose of the study along with a request to answer an online practical nursing education survey housed on surveymonkey.com was sent to an additional set of 1,000 randomly selected licensed practical nurses from the remaining 10,440 names. Thirty additional responses were received, bringing the total responses to 55 (2.75%).

In an effort to increase the response rate, a paper copy of the online survey, a cover letter explaining the purpose of the study containing a request to answer the survey either online or on paper, along with a self-addressed stamped return envelope was sent to an additional 1,233 randomly selected practical nurses from the remaining 9,440 names. Ninety-eight responses were received, bringing the total of responses to 153 or 4.73%. The response rate for the online request was 2.75% versus 7.9% for the paper survey. There were 364 postcards or surveys returned (11.26%) as undeliverable by the United States Postal Service.

In summary, a total of 3,233 postcards/surveys were sent to randomly selected practical nurses. There were 364 post cards or surveys returned as undeliverable by the USPS; thus 2,869 practical nurses were actually sampled. One hundred and fifty-three responses were received, bringing the final response rate to 5.3%.

Descriptive Analysis

Descriptive data collected was comprised of demographic, pre-nursing academic, nursing program academic, and NCLEX-PN characteristics of the sample. The independent variables examined were age at program admission, gender, individual and parental ethnicity, method of high school completion, high school rank, high school GPA, parental education level, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final nursing GPA.

The dependent variables examined in this study were practical nursing program persistence (defined as graduation upon first attempt in a practical nursing program) and NCLEX-PN success (defined as the successful first attempt at passing the NCLEX-PN exam). Variables were recorded as nominal, interval, or ratio level data. Nominal data had a binary outcome where data placement was in one of two categories. Interval and ratio data were recorded as actual numerical data.

To answer research questions 1 and 2, correlation analysis was used to determine the association between each independent variable and the dependent variables of nursing program persistence and NCLEX-PN results. Appropriate correlation tests were applied as

determined by the variable scales of measurement. A Phi coefficient analysis was used to determine the association between nominal independent variables such as gender and the nominal dependent variables of nursing program persistence and NCLEX-PN results. A Phi coefficient is appropriate when variables are assessed using nominal scales of measurement (Miller, 1998).

A point-biserial analysis was used to determine the association between the interval and ratio independent variables such as age and the dependent variables of nursing program persistence and NCLEX-PN results. The point-biserial correlation is a special case of the Pearson product-moment correlation, but a criterion for the Pearson correlation is that both variables be measured on an interval or ratio level. The nominal categories of the dependent variables do not meet this criterion. A point-biserial analysis is appropriate when one variable is continuous such as age and the other variable is nominal (Miller, 1998). Significance for the analyses was established at the 0.05 level of confidence. A significant Phi coefficient or Pearson product-moment correlation would indicate that a statistically significant relationship was found to exist between the independent variable being examined and the dependent variable.

A logistic analysis technique was used in this study to answer research questions 3 and 4 as there are multiple independent variables and there is a need to determine the relationship between those variables and a dependent variable. Logistic regression is a specialized form of regression that is formulated to predict and explain a categorical variable (Hair et al., 2006). Logistic regression is appropriate because the variables being studied are nominal in nature (Kerlinger & Lee, 2000; Miller, 1998). Specifically, binary logistic

regression analysis was conducted on those variables found to have a significant association with either the Phi coefficient and or the point-biserial analyses. Binary logistic regression is an appropriate analysis technique to use when there are two dependent variables (Hair et al., 2006).

Of the respondents, 96.1% were female (n=147) and 3.3% male (n=5). Only one respondent left the question blank. The age of the respondents ranged from 17 to 58 years of age. There were 150 respondents, which resulted in 36 different frequency categories. Over 20 of those categories had fewer than 5 frequencies; thus, ages were classified into five ranges for ease of further analysis. The most prevalent age group was between 22 and 29 years of age with the mean age at just under 31.

The majority of respondents (85.6%, n=131) reported receipt of a high school diploma as their method of high school graduation. Only 20 (13.1%) reported receipt of the GED as their method to high school completion. The majority of respondents (47.1%, n=72) reported a B average as their high school GPA. The majority of respondents reported their high school rank as being in the middle 1/3 of their class (34.6%, n=53). See Table 1 for the distribution of high school academic characteristics, which includes the number and percent of students by method of high school completion, high school rank in three categories, and high school GPA categorically by grade.

Table 1

Number and Percent of Students by Method of High School Completion, Rank, and GPA

Variable	n	%
Method of high school graduation		
High school graduation	131	85.6
GED	20	13.1
High school rank		
Top 1/3 of class	45	29.4
Middle 1/3 of class	53	34.6
Lower 1/3 of class	10	6.5
High school GPA		
A	27	17.6
B	72	47.1
C	37	24.2
D	2	1.3
Below D	1	0.7

The majority of respondents reported their ethnicity as White (74.5%, n=114) with the remaining 22.3% (n=34) reporting membership in various groups including Black (19.6%, n=30), Hispanic (0.7%, n=1), and American Indian (2.0%, n=3) ethnicities. One respondent reported “Other,” and four respondents left the question blank. Respondents in this study were also asked to report the ethnicity background of their parents. Statistical data on parental ethnicity was almost identical to the respondents’ own self-reported data. The reported numbers were very small in some of the ethnic categories; thus, the racial/ethnic background variable for the individual respondents and each of their parents was classified as minority or non-minority status for further data analysis. See Table 2 for a detailed breakdown of each of the ethnic groups reported.

Respondents reported English as a second language at the rate of 2.6% (n=4). In addition, respondents reported growing up in households that spoke only non-English at the rate of 2.0% (n=3).

The majority of respondents reported their marital status during nursing program enrollment as being married (45.1%, n=69). The next largest group reported was single (37.9%, n=58). The remaining groups (living with a partner, divorced, separated, widowed) reported small numbers, so for purposes of further data analysis the marital status variable was reclassified as single or non-single. Respondents reported having responsibility for children in the home during their nursing program enrollment at 52.3% (n=80).

The amount of annual income the respondents reported as earned prior to their enrollment in the nursing program varied greatly, but the majority of respondents reported an annual income of \$10,000 or less (34%, n=52). The majority of the respondents' parental combined annual income prior to entry into nursing school was reported as \$35,001 to \$50,000 (24.8%, n=38).

The majority of respondents reported both their mother's and father's education level as having obtained either a high school diploma or GED (mother at 35.9%, n=55; father at 39.9%, n=61). Respondents reported their mothers as having an associate degree or higher at 24.8% (n=38) versus 71.9% (n=110) as having no college degree. Respondents reported their fathers as having an associate degree or higher at 24.2% (n=37) versus 74.5% (n=114) as having no college degree. Both parents possessed a bachelor's degree or higher at almost the same rate of 11.0% (n=17) for mothers and 11.8% (n=18) for the fathers. Parental education was originally subdivided into three non-college levels and seven college levels for

a total of 10 levels. Some of the numbers reported were small, so for purposes of further data analysis, the parental educational variable was reclassified as having a college degree or not having a college degree. See Table 2 for a detailed breakdown of each of the reported parental educational levels.

The receipt of some sort of monetary educational assistance was reported by the majority of respondents (77%, n=118). This variable was subdivided into five categories and reported as scholarship assistance, financial aid, family/other assistance, employer assistance and student loans. Thirty percent of the respondents (n=46) reported receipt of monetary assistance in more than one category. There was an opportunity for the respondents to add comments if they received some assistance other than the provided categories. Some of the more frequent comments were reported as self-pay, 4.5% (n=7), assistance from unemployment, 3.2% (n=5), and 2.6% (n=4) reported receiving educational assistance from the military. See Table 2 for a detailed breakdown of monetary educational assistance reported.

The majority of respondents reported working at least some hours during their nursing school enrollment time. The most reported amount of time spent working was zero at n= 44 or 28.6%; however, 94 of the respondents (61.4%) reported some working responsibility each week. The mean number of hours worked per week was 16.65 with a standard deviation of 1.67. See Table 2 for the distribution of individual and family demographics, which includes the number and percent of students by gender, age, individual/parental ethnicity, individual/parental income, language preference, presence of

children in the home, marital status, working hours, receipt of educational monetary assistance, parental ethnicity, parental income, and parental educational levels.

Table 2

Number and Percent of Students by Individual and Family Demographics

Variable	n	%
Gender		
Female	147	96.1
Male	5	3.3
Age		
17yr-21yr	32	20.9
22yr-29yr	49	32.0
30yr-39yr	35	22.9
40yr-49yr	23	15.0
50yr and above	11	7.2
Individual ethnicity		
White	114	74.5
Black	30	19.6
Hispanic	1	0.7
American Indian	3	2.0
Other	1	0.7
Mother ethnicity		
White	115	75.2
Black	30	19.6
Hispanic	1	0.7
American Indian	4	2.6
Other	1	0.7
Father ethnicity		
White	114	74.5
Black	30	19.6
Hispanic	0	0
American Indian	4	2.6
Other	3	2.0
Individual income		
\$10,000 or less	52	34.0
\$10,001-\$20,000	40	26.1
\$20,001-\$35,000	43	28.1
\$35,001-\$50,000	12	7.8
\$50,001-\$100,000	4	2.6

Table 2 continued

\$100,001 and above	0	0
Parental income		
\$10,000 or less	12	7.8
\$10,001-\$20,000	17	11.1
\$20,001-\$35,000	26	17.0
\$35,001-\$50,000	38	24.8
\$50,001-\$100,000	32	20.9
\$100,001 and above	10	6.5
Language preference		
English as a second language	4	2.6
Non English childhood households	3	1.9
Mother education level		
Less than high school education	25	16.3
High school diploma or GED	55	35.9
Some college but no degree	30	19.6
Associate degree	20	13.1
College post associate degree	1	0.7
Bachelor's degree	11	7.2
College post bachelor's degree	2	1.3
Master's degree	4	2.6
College post master's degree	0	0
Doctoral degree	0	0
Father educational level		
Less than high school education	27	17.6
High school diploma or GED	61	39.9
Some college but no degree	26	17.0
Associate degree	18	11.8
College post associate degree	1	0.7
Bachelor's degree	12	7.8
College post bachelor's degree	2	1.3
Master's degree	2	1.3
College post master's degree	1	0.7
Doctoral degree	1	0.7
Children present during program enrollment	80	52.3
Marital status during program enrollment		
Married	69	45.1
Living with a partner	11	7.2
Single	58	37.9
Divorced	10	6.5
Separated	3	2.0
Widowed	1	0.7

Table 2 continued

Hours worked/week during program		
None	44	28.8
1hr-16hr	31	20.3
17hr-23hr	14	9.2
24hr-31hr	25	16.3
32hr-50hr	24	15.7
Educational monetary assistance		
Scholarship	35	22.7
Financial assistance	78	50.6
Family assistance	29	18.8
Employer assistance	7	4.5
Student loan	27	17.5

Respondents were asked to report the name of the admission/entrance exam required during their college application process. The use of admission/entrance exams is nearly universal in community colleges. Parsad, Lewis, and Greene (2003) found that 92% of 2-year institutions used exam scores for placement into either remedial education or college level courses. ACCUPLACER™, COMPASS/ESL™, and ASSET™ are examples of three commonly used college placement tests. Most community colleges accept almost anyone regardless of the student's level of ability. This means that students who can barely read will be accepted the same as students who are reading at the college level. In order to determine whether or not incoming students are academically prepared to do college-level work, most community colleges use one of the above mentioned placement tests. The ACCUPLACER and the COMPASS/ESL are computer adaptive tests (CAT) and the ASSET is a paper/pencil test (National College Transition Network, 2008). Most will also accept SAT or ACT scores in lieu of the ASSET/COMPASS exams.

The respondents reported taking the ASSET exam at 17% (n=26) and the COMPASS exam at 20.9% (n= 32). The TEAS test was the next highest reported as the required entrance exam at the rate of 5.9% (n=10). A large portion (42.5%, n=65) of the respondents answered this question as "not applicable" or "don't remember". For further analysis, the variable of college entrance exam was classified as no college entrance exam required or yes college entrance required.

Respondents were asked to report the taking of remedial courses. Remedial courses are assigned based on college entrance test scores and allow students to improve skills in a subject to ready them for college work in that area. The skills tested are usually classified into reading, writing, and math (The College Board, 2015). Course descriptions of applicable remedial courses can be found in the definition of terms section in Chapter 1. A little less than half of the respondents (42.5%, n=65) reported taking at least one remedial course. Remedial course grades were reported by the respondents as A, B, or C. None of the respondents reported a grade of less than C. See Table 3 for distribution of the number and percent of students by the type of preadmission college entrance exam taken by category and remedial course/grade characteristics which include reading, English, and math at the 060, 070, 080, and 090 levels.

Table 3

Number and Percent of Students by Preadmission College Entrance Exam and Remedial Courses/Grades

Variable	n	%
College entrance exam		
Asset	26	16.9
Compass	32	20.8
Other	27	17.5
RED 060	2	1.3
A	1	0.7
B	0	0
C	1	0.7
RED 070	4	2.6
A	3	2.0
B	1	0.7
C	0	0
RED 080	4	2.6
A	2	1.3
B	1	0.7
C	1	0.7
RED 090	11	7.2
A	8	5.2
B	2	1.3
C	0	0
ENG 060	3	2.0
A	1	0.7
B	0	0
C	1	0.7
ENG 070	7	4.6
A	3	2.0
B	4	2.6
C	0	0
ENG 080	6	3.9
A	3	2.0
B	3	2.0
C	0	0
ENG 090	15	9.8
A	9	5.9
B	5	3.3
C	0	0
	21	13.7

Table 3 continued

MAT 060			
A	8	5.2	
B	8	5.2	
C	4	2.6	
MAT 070	31	20.3	
A	12	7.8	
B	10	6.5	
C	7	4.6	
MAT 080	12	7.8	
A	7	4.6	
B	3	2.0	
C	1	0.7	
MAT 090	19	12.4	
A	11	7.2	
B	4	2.6	
C	2	1.3	

Respondents were asked to delineate which Anatomy and Physiology course was taken to satisfy the practical nursing program requirement. Course descriptions of BIO 163, BIO 168, and BIO 169 can be found in the definition of terms section in Chapter 1. Practical nursing programs require an anatomy and physiology course that provides a basic study of the human body. Biology 163 fits this requirement in one comprehensive course. Some students in preparation for future advanced studies may elect to take a higher level Anatomy and Physiology course, but to satisfy the comprehensive study of the entire human body, both Biology 168 and 169 must be taken. Most programs allow the transfer of previously taken Anatomy and Physiology course grades if the courses were taken within a specific time frame prior to entering the nursing program. The majority of respondents reported taking BIO 168 and BIO 169 as meeting the practical nursing program requirement. Approximately one-third reported a previous BIO course transferred from another institution. BIO grades

were reported by the respondents as A, B, or C. None of the respondents reported a grade below C.

The majority of respondents reported their pre-nursing college GPA prior to entering the nursing program as a B average (41.2%, n=63). Eighteen (11.8%) respondents reported with not applicable/other. Of the 18 respondents, 11 of those cited having no previous college experience prior to nursing school.

Many nursing programs require the passing of a pre-nursing entrance admission exam prior to entering the nursing program. The majority of respondents in this survey (68.6%, n=105) reported this as a requirement, and 45 or 29.4% said no exam was required. Respondents were also asked to list the name of the exam. The TEAS was the most frequent nursing pre-admission test named at n=27 or 17.6% followed by the NET at n=8 or 5.2% and then the HOBET at n=4 or 2.6%. Thirty-one or 20.3% reported either not knowing the name of the test, or they could not recall the name of the test.

Respondents were also asked if a passing score was a pre-nursing admission requirement, was remediation offered, and 18 or 11% reported yes, 14 or 9.2% reported no, and 110 or 71.9% responded with either not applicable or they did not remember. A few respondents did list some remediation types such as taking a study skills class, one-on-one counseling, or taking a practice test. See Table 4 for the number and percent of students by pre-nursing GPA, nursing admission exam requirement, and anatomy/physiology course/grade which include, BIO 163, BIO 168, BIO 169, and transferred biology courses.

Table 4

Number and Percent of Students by Pre-Nursing GPA, Admission Exam Requirement, and Anatomy/Physiology Course/Grades

Variable	n	%
Pre-nursing college GPA		
A	40	26.1
B	63	41.2
C	23	15.0
D	2	1.3
Pre-nursing admission exam required		
Yes	105	68.6
No	45	29.4
Pre-nursing admission exam remediation offered		
Yes	18	11.0
No	14	9.2
NA/don't remember	110	71.9
Biology 163	37	24
A	20	13.1
B	12	7.8
C	4	2.6
Biology 168	66	42.9
A	22	14.4
B	30	19.6
C	12	7.8
Biology 169	62	40.3
A	24	15.7
B	21	13.7
C	16	10.5
Previous biology transferred	51	33.1
A	14	9.2
B	13	8.5
C	5	3.3

Respondents were asked to report grades achieved in each of the three nursing courses required in the practical nursing program. Descriptions of Practical Nursing I (NUR 101), Practical Nursing II (NUR 102), and Practical Nursing III (NUR 103) can be found in the definition of terms section in Chapter 1. The majority of grades reported in NUR 101

were evenly split between A and B, each at n=46 or 30.1%. The majority of grades reported in NUR 102 and NUR 103 were B averages at n=53 or 34.6% and n=51 or 33.3% respectively. There were 34 non-responses in NUR101, 32 in NUR 102, and 33 in NUR 103. Some of these non-responses could possibly be attributed to failing the nursing program on their first attempt.

Respondents were asked to report if an exit exam was required to graduate from the practical nursing program. The results were almost evenly split with 72 or 47.1% responding yes and 78 or 51% responding no. Respondents were asked to name the exit exam if required, and the majority (33.3%, n=24) reported it to be the "final exam," and 10 or 13.9% reported the exit exam to have been the ATI exam. Of the remaining respondents, one person (1.4%) named the HESI, one person (1.4%) named the NAPNES, and five (6.9%) named an NCLEX review as their exit exam name. The remaining respondents (43%, n=32) stated they did not remember the name of the exam or left the question unanswered.

Respondents were asked if a passing grade for the exit exam was a requirement for graduation, and 64 or 41.8% responded yes. When asked if remediation was offered to those who had not passed the required exit exam, 7.2% or 11 persons responded yes. Respondents who answered yes were asked to list the type of remediation offered. Eight persons provided answers which tended to be non-formal in nature such as study guides, class review, or study groups.

Respondents were asked to report their final college GPA after completion of the practical nursing program. Of the respondents, 35 (22.9%) reported an A average, 77 (50.3%) reported a B average, and 33 (21.6%) reported a C average as their final GPA.

There were 7 non-responses. See Table 5 for the number and percent of students by nursing course grades, nursing program exit exam requirements, and final college GPA.

Table 5

Number and Percent of Students by Nursing Program Courses/Grades, Exit Exam Requirements, and Final College GPA

Variable	n	%
NUR 101		
A	46	30.1
B	46	30.1
C	27	17.6
NUR 102		
A	35	22.9
B	53	34.6
C	33	21.6
NUR 103		
A	36	23.5
B	51	33.3
C	33	21.6
Nursing program exit exam required		
Yes	72	47.1
No	78	51
Nursing program exit exam passing grade required		
Yes	64	41.8
No	10	6.5
NA	76	49.7
Nursing program exit exam remediation offered		
Yes	11	7.2
No	27	17.6
NA	108	70.6
Final college GPA		
A	36	23.5
B	77	50.3
C	33	21.6

Respondents who were unsuccessful in graduating from their practical nursing program on the first attempt were asked to categorize factors they felt may have contributed to the failed attempt. The most common factor reported was family obligations (2.6%, n=4) followed by work obligations (2%, n=3). Six of the respondents were responsible for all 11 factors given as being contributory to lack of success, and 3 of those 6 respondents selected multiple categories.

The dependent variables examined in this study were graduation upon first attempt (persistence) in a practical nursing program and the successful first attempt at passing the NCLEX-PN exam. Questions asked of survey respondents in order to gather data on these two variables included, (a) What month and year did you first enter a practical nursing program? (b) If applicable, what month and year did you graduate from your first attempt in a practical nursing program? (c) If you did not graduate on your first attempt in a practical nursing program, what do you feel most attributed to you not being able to complete the program? (d) If you took and passed the NCLEX-PN exam on the first attempt, what reason do you attribute most to being successful on that first attempt? and (e) If you were unable to pass the NCLEX PN on the first attempt, what reason do you attribute most to being unsuccessful?

Responses to all of the questions and the comments in this survey allowed the ability to code respondents as either having persisted in the practical nursing program (graduated first attempt) or having not persisted in the practical nursing program (did not graduate first attempt), as well as having passed the NCLEX-PN upon the first attempt or having not

passed the NCLEX-PN the first attempt. See Table 6 for number and percent of students by practical nursing program persistence and NCLEX-PN first attempt pass/fail results.

Table 6

Number and Percent of Students by Practical Nursing Program Persistence and NCLEX-PN First Attempt Pass/Fail Results

Variable	n	%
Practical nursing program persistence		
Yes	121	79.1
No	14	9.2
NCLEX-PN success		
Yes/Pass	142	92.8
No/Fail	7	4.6

Research Questions

Research question 1. What is the relationship between the variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) and practical nursing program persistence/retention?

A Phi coefficient analysis was conducted to determine if there was an association between the nominal independent variables of gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, marital status during nursing program, the presence of children in the home during the nursing program, English as a second language, the language spoken in the childhood home, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, pre-nursing admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, final college GPA, and the dependent variable of practical nursing program persistence/retention.

The Phi coefficient analysis did show a statistically significant association between the variables of father ethnicity, gender, receipt of student loans, the taking of some remedial courses (RED 060, RED 080, ENG 060, ENG 080), the grades of some of the remedial courses (RED 060, RED 080, ENG 060, MAT 080), the requirement of a pre-nursing admission exam, and the offering of remediation at the exit exam point of the nursing program, with the dependent variable of practical nursing program persistence/retention. See Table 7 for the statistically significant Phi coefficient results of the above mentioned independent variables and the dependent variable of practical nursing persistence/retention.

Table 7

Phi Coefficient Statistically Significant Results of the Independent Variables as Correlated with Dependent Variable Practical Nursing Persistence/Retention

Variable	Phi coefficient	p
Father ethnicity	.171	.047*
Gender	.255	.012*
Receipt of Student loans	-.234	.007*
RED 060	-.254	.003*
RED 080	-.227	.008*
RED 060 grade	-.254	.003*
RED 080 grade	.302	.006*
ENG 060	-.254	.003*
ENG 080	-.191	.027*
ENG 060 grade	-.254	.003*
MAT 080 grade	.261	.027*
Pre-nursing admission exam required	-.172	.048*
Nursing program exit exam remediation offered	.224	.038*

Note. *p < .05

Father ethnicity yielded a Phi coefficient value of .171 with a probability value of .047. Students whose father was White had a 93% success rate, and those students whose father's ethnicity was non-White had a success rate of 81%. Gender yielded a Phi coefficient value of .255 with a probability value of .012. Female students had a 90% success rate, and male students tended to not persist in the practical nursing program. Students who received student loans yielded a Phi coefficient value of -.234 with a probability value of .007. Students who received student loans had a success rate of 73.9%, and students who did not receive student loans had a success rate of 92.8%.

The completion of remedial course RED 060 yielded a Phi coefficient value of -.254 with a probability value of .003. Students who did not take RED 060 had a success rate of 90%, yet students who did take RED 060 tended to not persist in the practical nursing

program. The completion of remedial course RED 080 yielded a Phi coefficient value of -.227 and a probability value of .008. Students who did not take RED 080 had a success rate of 90.8%, and students who did take RED 080 had a success rate of 50%.

The completion of remedial course ENG 060 yielded a Phi coefficient value of -.254 and a probability value of .003. Students who did not take ENG 060 had a success rate of 90.3%, yet those students who took ENG 060 tended to not persist in the practical nursing program. The completion of remedial course ENG 080 yielded a Phi coefficient value of -.191 and a probability value of .027. Students who did not take ENG 080 had a success rate of 90.8%, and students who took ENG 080 had a success rate of 60%.

The RED 060 grade yielded a Phi coefficient value of -.254 and a probability value of .003. Only two students reported taking the course. One student reported receipt of a grade of A and the other a grade of C. The student who reported the grade of C did not provide a nursing program completion date and was unable to be counted in the graduation numbers. The one student who reported the grade of A did not graduate from the nursing program thus the negative Phi coefficient value. The RED 080 grade yielded a Phi coefficient value of .302 with a probability value of .006. Four students reported a grade in this course. Two of the students reported receipt of an A, and only one of those two graduated. One student reported a B, and this student did not graduate. One student reported a C, and this student did graduate.

The ENG 060 grade yielded a Phi coefficient value of -.254 and a probability value of .003. One student reported receipt of a grade of A and the other a grade of C. The student who reported the grade of C did not provide a nursing program completion date and was

unable to be counted in the graduation numbers. The one student who reported the grade of A did not graduate from the nursing program thus the negative Phi coefficient value. The MAT 080 grade yielded a Phi coefficient value of .261 and a probability value of .028. Students who made an A in the MAT 080 course had an 85.7% success rate. Students who made a B in the MAT 080 course had a 100% success rate, and students who made a C were not successful. Students who actually took these remedial classes were very few in number.

The requirement of a pre-nursing admission exam yielded a Phi coefficient value of -.172 and a probability of .048. Students who were not required to take a pre-nursing admission program exam had a success rate of 97.5%, and students who were required to take a pre-nursing admission program exam had a success rate of 86%. The offering of remediation at the exit exam point of the nursing program yielded a Phi coefficient value of .224 with a probability value of .038. Students who were offered remediation had a success rate of 70%, and students who were not offered remediation had a success rate of 100%. See Table 7 for the Phi Coefficient Statistically Significant Results and Practical Nursing Program Persistence.

The Phi coefficient analysis did not show any statistical significance with the variables of individual ethnicity, maternal ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, marital status during nursing program enrollment, the presence of children in the home during the nursing program, English as a second language, the language spoken in the childhood home, receipt of monetary educational assistance except for student loans, college admission testing, pre-nursing college GPA, completion of most of the remedial courses (RED070, RED090, ENG

070, ENG 090, MAT 060, MAT 070, MAT 080, MAT 090), most of the remedial course grades (RED070, RED090, ENG 070, ENG 080, ENG 090, MAT 060, MAT 070, MAT 090), completion of anatomy and physiology courses/grades, individual nursing course grades and final college GPA, as correlated with the dependent variable of practical nursing program persistence/retention. See Table 8 for a display of these non-statistically significant results.

Table 8

Phi Coefficient Non-Statistically Significant Results of the Independent Variables as Correlated with Dependent Variable Practical Nursing Program Persistence/Retention

Variable	Phi coefficient	p
High school graduation	.010	.912
High school GPA	.107	.911
High school rank	.100	.852
Ethnicity	.052	.540
Mother ethnicity	.118	.174
Marital status	.003	.977
Presence of children	.010	.905
Scholarship assistance	-.083	.338
Financial assistance	.061	.477
Family assistance	.043	.618
Employer assistance	.067	.438
Mother education level	-.010	.908
Father education level	.025	.769
English as a second language	-.051	.551
Language spoken in childhood home	.067	.756
College admission testing	.154	.111
RED 070	-.114	.187
RED 090	-.089	.299
RED 070 grade	-.114	.187
RED 090 grade	.144	.248
ENG 070	-.045	.605
ENG 090	.036	.676
ENG 070 grade	.127	.338

Table 8 continued

ENG 080 grade	.197	.072
ENG 090	.069	.730
MAT 060	-.072	.403
MAT 070	.054	.529
MAT 080	-.065	.454
MAT 090	-.026	.766
MAT 060 grade	.121	.578
MAT 070 grade	.102	.711
MAT 090 grade	.162	.324
BIO 163	-.021	.811
BIO 168	.065	.452
BIO 169	-.004	.959
BIO transferred	.029	.735
BIO 163 grade	.337	.145
BIO 168 grade	.155	.494
BIO 169 grade	.147	.545
BIO transferred grade	.189	.608
Pre-nursing college GPA	.107	.827
Pre-nursing admission exam remediation offered	.065	.765
Nursing program exit exam required	.073	.405
Nursing program exam pass grade required	.116	.410
NUR 101	.113	.507
NUR 102	.060	.820
NUR 103	.023	.973
Final college GPA	.059	.801

A point-biserial correlation was conducted to determine if there was an association between the continuous independent variables of age at program admission, individual and parental income prior to program admission, number of hours worked per week during nursing program enrollment, and the dependent variable of practical nursing program persistence/retention.

The point-biserial correlation did not show any statistical significance with the variables of age at program admission, individual and parental income prior to program

admission, and number of hours worked per week during nursing program enrollment as correlated with the dependent variable of practical nursing program persistence/retention. See Table 9 for these results.

Table 9

Point-biserial Non-Statistically Significant Results of Independent Variables as Correlated with Dependent Variable Nursing Program Persistence/Retention

Variable	r	p
Age	.067	.446
Individual income	.093	.285
Parental income	.082	.373
Hours worked	.016	.862

Research question 2. What is the relationship between the variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades , nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) and NCLEX-PN success?

A Phi coefficient analysis was conducted to determine if there was an association between the nominal independent variables of gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, marital status during nursing program, the presence of children in the home during the nursing program, English as a second language, the language spoken in the childhood home, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, pre-nursing admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA and the dependent variable of the success on the NCLEX-PN.

The Phi coefficient analysis did show a statistically significant association between the independent variables of one remedial reading course grade (RED 080), the biology transferred grade, pre-nursing college GPA, the offering of remediation at the exit exam point of the nursing program, and the dependent variable of success on the NCLEX-PN. The RED 080 course and the MAT 070 grade yielded results approaching significance.

The RED 080 course grade yielded a Phi coefficient value of .371 with a probability value of .000. Students who received higher grades tended to be more successful upon passing the NCLEX on the first attempt. The transferred BIO grade yielded a Phi coefficient value of .474 with a probability value of .031. Students who had higher transferred BIO grades tended to be more successful in passing the NCLEX on the first attempt.

College GPA prior to entering a practical nursing program or pre-nursing college GPA yielded a Phi coefficient value of .333 and a probability value of .005. Students with a

higher pre-nursing college GPA had a higher success rate of passing the NCLEX-PN than those who had a lower pre-nursing college GPA. Students with an A average had a 100% success rate, students with a B average had a 96.8% success rate, students with a C average had an 85% success rate, and students with a D average had a 50% success rate.

The offering of remediation at the exit exam point of the nursing program yielded a Phi coefficient value of .209 with a probability value of .044. Students who were offered remediation had an 80% success rate, and students who were not offered remediation had a success rate of 100%. See Table 10 for the Phi Coefficient statistically significant results of the independent variables, college GPA prior to nursing program, RED 080 grade, biology transferred grade, and the offering of remediation at the exit exam point of the nursing program as correlated with the dependent variable of NCLEX-PN success.

The RED 080 course and the MAT 070 grade yielded results approaching significance. The RED 080 course yielded a Phi coefficient value of -.159 with a probability value of .052. Students who did not take RED 080 had a higher success rate of passing the NCLEX-PN exam than those students who took RED 080. The course grade for MAT 070 yielded a Phi coefficient value of .228 with a probability of .055. Students who had higher MAT 070 grades tended to be more successful in passing the NCLEX on the first attempt. See Table 11 for the Phi Coefficient results of the independent variables of course RED 080 and MAT 070 grade as correlated with the dependent variable of NCLEX-PN success.

Table 10

Phi Coefficient Statistically Significant Results of Independent Variables as Correlated with Dependent Variable NCLEX-PN Success

Variable	Phi coefficient	p
Pre-nursing college GPA	.330	.004*
RED 080 grade	.371	.000**
Biology transferred grade	.474	.031*
Nursing program exit exam remediation offered	.209	.044*

Note. *p < .05, **p < .01

Table 11

Phi Coefficient Results of Independent Variables as Correlated with Dependent Variable of NCLEX-PN Success

Variable	Phi coefficient	p
RED 080 course	-.159	.052
MAT 070 grade	.228	.055

The Phi coefficient analysis did not show any statistical significance with the independent nominal variables of gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, marital status during nursing program, the presence of children in the home during the nursing program, English as a second language, the language spoken in the childhood home, receipt of monetary educational assistance, college admission testing, the taking of remedial courses/grades except for the grade in RED 080, pre-nursing admission testing, anatomy and physiology courses/grades except for the biology transferred grade, individual nursing course

grades, final college GPA, and the dependent variable of success on the NCLEX-PN. See Table 12 for these results.

Table 12

Phi Coefficient Non-Statistically Significant Results of Independent Variables Correlated with the Dependent Variable of NCLEX-PN Success

Variable	Phi coefficient	p
High school graduation	-.087	.286
High school GPA	.193	.370
High school rank	.224	.116
Ethnicity	.024	.770
Mother ethnicity	.025	.762
Father ethnicity	.021	.797
Gender	-.041	.614
Marital status	.112	.172
Presence of children	.051	.540
Scholarship assistance	-.101	.216
Financial assistance	-.088	.284
Family assistance	-.056	.497
Employer assistance	.049	.547
Student loan assistance	-.060	.462
Mother education level	.043	.605
Father education level	-.018	.823
English as a second language	-.037	.653
Language at home	.050	.845
College admission test	.041	.652
RED 060 course	.026	.752
RED 070 course	.037	.653
RED 080 course	-.159	.052
RED 090 course	-.059	.474
RED 060 grade	.026	.951
RED 070 grade	.037	.904
RED 090 grade	.091	.544
ENG 060 course	.032	.698
ENG 070 course	-.116	.157
ENG 080 course	.045	.579
ENG 090 course	-.031	.704
ENG 060 grade	.026	.951

Table 12 continued

ENG 070 grade	.162	.142
ENG 080 grade	.045	.857
ENG 090 grade	.144	.217
MAT 060 course	-.001	.988
MAT 070 course	-.121	.141
MAT 080 course	-.051	.535
MAT 090 course	.085	.300
MAT 060grade	.106	.641
MAT 070grade	.228	.055
MAT 080grade	.106	.647
MAT 090grade	.081	.811
BIO 163 course	.054	.508
BIO 168 course	.067	.411
BIO 169 course	-.009	.916
BIO transferred course	.091	.269
BIO 163 grade	.151	.663
BIO 168 grade	.196	.298
BIO 169 grade	.199	.306
Pre-nursing admission exam required	-.061	.463
Pre-nursing admission exam remediation offered	.034	.923
Nursing program exit exam required	-.043	.605
Nursing program exit exam pass grade required	.070	.698
NUR 101	.160	.219
NUR 102	.163	.205
NUR 103	.159	.222
Final college GPA	.109	.430

A point-biserial correlation was conducted to determine if there was an association between the continuous independent variables of age at program admission, individual and parental income prior to program admission, number of hours worked per week during nursing program enrollment, and the dependent variable of success on the NCLEX-PN.

The point-biserial correlation did not yield any statistical significance with the continuous variables of age at program admission, individual and parental income prior to

program admission, number of hours worked per week during nursing program enrollment, and the dependent variable of success on the NCLEX-PN. See Table 13 for these results.

Table 13

Point-biserial Non-Statistically Significant Results of the Independent Variables as Correlated with NCLEX-PN Success

Variable	r	p
Age	-.054	.518
Individual Income	.013	.878
Parental Income	.033	.705
Hours Worked	-.013	.877

A logistic analysis technique was used in this study to answer research questions 3 and 4 as there are multiple independent variables and there is a need to determine the relationship between those variables and a dependent variable. Logistic regression is a specialized form of regression that is formulated to predict and explain a categorical variable (Hair et al., 2006). Logistic regression is appropriate because the variables being studied are nominal in nature (Kerlinger & Lee, 2000; Miller, 1998). Specifically, binary logistic regression analysis was conducted on those variables found to have a significant association with either the Phi coefficient and/or the point-biserial analyses. Binary logistic regression is an appropriate analysis technique to use because there are two dependent variables (Hair et al., 2006).

Research question 3. What set of variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program

admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) provided the best prediction of practical nursing program persistence/retention?

The independent variables found to have a statistically significant relationship with the dependent variable of nursing program persistence/retention using the Phi coefficient analysis (father ethnicity, gender, receipt of student loans, the taking of some remedial courses [RED 060, RED 080, ENG 060, ENG 080], some of the remedial course grades [RED 060, RED 080, ENG 060, MAT 080], the requirement of a pre-nursing admission exam, and the offering of remediation at the exit point of the nursing program) were included in the logistical analysis. The simultaneous enter method was used to guide the 13 independent variables into the model. Ten of the 13 independent variables remained in the final model. The three that failed to remain in the final model were RED 060 grade, ENG 060 course, and ENG 060 grade.

The Omnibus Test of Model Coefficients rendered a Chi-square value of 26.418 with 10 degrees of freedom and a probability value of $p = .003$, which indicated that the new model was a better fit than the base model. The initial -2LL value started at 84.097. The final model summary revealed a -2LL value of 57.679. The -2LL is a test of the significance

of the difference between the likelihood ratio for the researcher's model with predictors minus the likelihood ratio for the baseline model with only a constant in it. Probabilities are less than one, so log likelihood values are always negative and noted as -2LL. Smaller values of the -2LL measure indicate better model fit. The -2LL value in this analysis decreased by 26.418; thus, revealing a better fitting model with the inclusion of the researcher's predictor variables.

The Cox & Snell's R-Square was .186, and the Nagelkerke R-Square was .387, indicating that between 18.6% and 38.7% of the variation in persistence/retention in the nursing program was explained by the predictor variables. The Hosmer and Lemeshow test rendered a Chi-square statistic of 3.743 with a significance of .711 which means the new model was a better fit than the base model. Prediction success overall was 92.2% (23.1% for non-graduation/non-persistence and 100% for graduation/persistence), which was an increase from the original model's classification probability of 89.8% (0% for non-graduation/non-persistence and 100% for graduation/persistence).

The Wald criterion demonstrated that only receipt of student loans made a significant contribution in predicting nursing program persistence/retention ($p = .023$). The rest of the variables (father ethnicity, gender, RED 060 course, RED 080 course, ENG 080 course, RED 080 grade, MAT 080 grade, the requirement of a pre-nursing admission exam, and the offering of remediation at the exit exam point of the nursing program) were not significant predictors. The EXP(B) value of the independent variable receipt of student loans was .193 which indicated that when that value increased by one unit, the odds ratio was .193 times as large, meaning in this case for each additional student that received a student loan, that

student was .193 times less likely to graduate. See Table 14 for results of the goodness of fit measures and Table 15 for the final logistical analysis results of the model which included the independent variables of father ethnicity, gender, receipt of student loans, the courses of RED 060 and RED 080, grades from RED 080 and MAT 080, pre-nursing admission exam required, remediation offered at exit point of nursing program, and the dependent variable of nursing program persistence/retention.

Table 14

Goodness of Fit Measurements Containing the Independent Variables and the Dependent Variable of Nursing Program Persistence/Retention

Goodness of Fit Measures	Value	Sig.
-2 Log Likelihood (-2LL)	57.679	-----
Hosmer and Lemeshow	3.743	.711
Cox and Snell R ²	.186	-----
Nagelkerke R ²	.387	-----

Table 15

Logistic Regression Model Results Containing the Independent Variables and the Dependent Variable of Nursing Program Persistence/Retention

Independent Variable	B	SE	Wald	df	Sig.	Exp(B)
Father Ethnicity	.742	.740	1.006	1	.316	2.101
Gender	42.722	4240.327	.000	1	.992	3.580E+18
Student loans	-1.648	.724	5.182	1	.023*	.193
RED 060 course	-36.566	40251.376	.000	1	.999	.000
RED 080 course	53.781	5092.815	.000	1	.992	2.273E+23
RED 080 grade	-41.749	3441.140	.000	1	.990	.000
ENG 080 course	12.655	2167.588	.000	1	.995	313277.800
MAT 080 grade	23.823	1628.686	.000	1	.988	2.218E+10

Table 15 continued

Pre-nursing admission exam required	-1.366	1.101	1.539	1	.215	.255
Remediation offered at exit point of program	.194	.724	.072	1	.788	1.214
Constant	-38.024	4240.328	.000	1	.993	.000

Note. *p < .05

Research question 4. What set of variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) provided the best prediction of NCLEX-PN success?

The independent variables found to have a statistically significant relationship with the dependent variable of NCLEX-PN success using the Phi coefficient analysis (remedial course grade of RED 080, pre-nursing college GPA, previous biology transferred grade and the offering of remediation at the exit point of the nursing program) were included in the

logistical analysis. The simultaneous enter method was used to guide the four independent variables into the model. All four variables were retained in the final model.

The Omnibus Test of Model Coefficients rendered a Chi-square value of 6.648 with 4 degrees of freedom and a probability value of $p = .144$, which did not pass this goodness of fit test, meaning that the new model with the predictors was not a better fitting model than the base model without the predictors. The initial -2LL value decreased from 55.889 to 49.041, indicating the new model containing the variables was a slightly better fit over the constant only model.

The Cox & Snell's R-Square was .047, and the Nagelkerke R-Square was .145, indicating that between 4.7% and 14.5% of the variation in NCLEX-PN success was explained by the predictor variables. The Hosmer and Lemeshow test rendered a Chi-square statistic of 7.661 with a significance of .363, indicating the new model was a slightly better fit than the base model. Prediction success overall was 95.1% (0% for non-NCLEX-PN success and 100% for NCLEX-PN success). There was no change from the original model's classification probability of 95.1% (0% for non-NCLEX-PN success and 100% for NCLEX-PN success).

The Wald criterion demonstrated that none of the variables significantly contributed to the model at the significance level of $p = .05$. Pre-nursing college GPA did achieve a probability value approaching significance at $p = .053$ with a Wald value of 3.742 and an EXP(B) value of 1.745, meaning that with each one unit increase in pre-nursing college GPA, the student was 1.745 times more likely to achieve NCLEX-PN success. See Table 16 for results of the goodness of fit measures and Table 17 for the final logistical analysis results

of the model which included the independent variables of the RED 080 grade, pre-nursing college GPA, the transferred biology grade, remediation offered at the exit point of the nursing program, and the dependent variable of NCLEX-PN success.

Table 16

Goodness of Fit Measurements Containing the Independent Variables and the Dependent Variable of NCLEX-PN Success

Goodness of fit measures	Value	Sig
-2 Log Likelihood (-2LL)	49.041	-----
Hosmer and Lemeshow	7.661	.363
Cox and Snell R ²	.047	-----
Nagelkerke R ²	.145	-----

Table 17

Logistic Regression Model Results Containing the Independent Variables and the Dependent Variable of NCLEX-PN Success

Independent Variable	B	SE	Wald	df	Sig.	Exp(B)
RED 080 Grade	-.500	.758	.425	1	.510	.607
Pre-nursing college GPA	.557	.288	3.742	1	.053	1.745
Biology transfer grade	.693	.708	.957	1	.328	1.999
Remediation offered at exit point of program	-.678	.540	1.576	1	.209	.508
Constant	1.766	.705	6.275	1	.012	5.845

Summary

This study was conducted to examine those variables that may assist in predicting persistence in licensed practical nursing programs as well as those variables that may assist in predicting first time success on the practical nursing licensure exam. This chapter described the demographics of the sample used in this study, the characteristics of the findings, and results of statistical inquiry.

The study's final sample consisted of 153 licensed practical nurses who had obtained a license to practice in the state North Carolina between the years of 2000 and 2011. The final sample size was obtained by sending a total of 3,233 postcards/surveys to randomly selected practical nurses from a list provided by the NCBON who had obtained a license to practice in the state of North Carolina between the years of 2000 and 2011. There were 364 postcards or surveys returned as undeliverable by the USPS; thus 2,869 practical nurses were actually sampled. One hundred and fifty-three responses were received, bringing the final response rate to 5.3%.

Descriptive data collected was comprised of demographic, pre-nursing academic, nursing program academic, and NCLEX-PN characteristics of the sample. The independent variables examined were age at program admission, gender, individual and parental ethnicity, method of high school completion, high school rank, high school GPA, parental education level, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary

educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA.

The dependent variables examined in this study were practical nursing program persistence (defined as graduation upon first attempt in a practical nursing program) and NCLEX-PN success (defined as the successful first attempt at passing the NCLEX-PN exam). Variables were recorded as nominal, interval, or ratio level data. Nominal data had a binary outcome where data placement was in one of two categories. Interval and ratio data were recorded as actual numerical data.

Highlights of some of the demographic and academic data revealed that of the respondents, 96.1% were female (n=147) and 3.3% male (n=5). This is fairly consistent with statistics reported by the North Carolina Board of Nursing (2010a) in 2009 in which females comprised 92.4% of the population in practical nursing programs versus the male population of 7.4%.

The majority of respondents reported their ethnicity as White (74.5%, n=114) with the remaining 22.3% (n=34) reporting membership in various groups including Black (19.6%, n=30), Hispanic (0.7%, n=1), and American Indian (2.0%, n=3) ethnicities. These percentages are slightly higher than those reported by the North Carolina Board of Nursing (2010a) in which minority students self-reported at 16%.

The age of the respondents ranged from 17 to 58 years of age. The most prevalent age group was between 22 and 29 years of age with the mean age at just under 31. This is a

decade younger than reported by the North Carolina Board of Nursing (2010a) which reported that in 2009 the most prevalent age group of practical nursing students was between 31 and 40 years of age.

The majority of respondents (85.6%, n=131) reported receipt of a high school diploma as their method of high school graduation. The majority of respondents reported both their mother's and father's education level as having obtained either a high school diploma or GED (mother at 35.9%, n=55; father at 39.9%, n=61). Respondents reported their mothers as having an associate degree or higher at 24.8% (n=38) versus 71.9% (n=110) as having no college degree. Respondents reported their fathers as having an associate degree or higher at 24.2% (n=37) versus 74.5% (n=114) as having no college degree. The amount of annual income the respondents reported as earned prior to their enrollment in the nursing program varied greatly, but the majority of respondents reported an annual income of \$10,000 or less (34%, n=52). The majority of the respondents' parental combined annual income prior to entry into nursing school was reported as \$35,001 to \$50,000 (24.8%, n=38).

The majority of respondents did graduate upon the first attempt at the practical nursing program (79.1%, n=121) and the majority of respondents did successfully pass the NCLEX-PN exam upon their first attempt (92.8%, n=142). This study's graduation rates and NCLEX-PN pass rates differ slightly than those reported by the North Carolina Board of Nursing (2010b, 2010c). The North Carolina Board of Nursing (2010b) reported on-time graduation rates for 2009 to be 68%. The national NCLEX-PN pass rate for 2009 was 86%. The North Carolina NCLEX-PN pass rate for 2009 was 95% (North Carolina Board of Nursing, 2010c).

Correlation analysis was used to determine the association between each independent variable and the dependent variables of nursing program persistence and NCLEX-PN results. Appropriate correlation tests were applied as determined by the variable scales of measurement. A Phi coefficient analysis was used to determine the association between nominal independent variables such as gender and the nominal dependent variables of nursing program persistence and NCLEX-PN results. A point-biserial analysis was used to determine the association between the interval and ratio independent variables such as age and the dependent variables of nursing program persistence and NCLEX-PN results.

A logistic analysis technique was used in this study to determine the relationship between those independent variables that showed a significant correlation using the Phi coefficient and point-biserial techniques and the two dependent variables. Logistic regression is a specialized form of regression that is formulated to predict and explain a categorical variable. Specifically binary logistic regression analysis was used as this is the appropriate analysis technique to use when there are two dependent variables (Hair et al., 2006).

The Phi coefficient analysis did show a statistically significant association between the variables of father ethnicity, gender, receipt of student loans, the taking of some remedial courses (RED 060, RED 080, ENG 060, ENG 080), the grades of some of the remedial courses (RED 060, RED 080, ENG 060, MAT 080), the requirement of a pre-nursing admission exam, and the offering of remediation at the exit exam point of the nursing program, with the dependent variable of practical nursing program persistence/retention. The Phi coefficient analysis also showed a statistically significant association between the

independent variables of one remedial reading course grade (RED 080), the biology transferred grade, pre-nursing college GPA, the offering of remediation at the exit exam point of the nursing program, and the dependent variable of success on the NCLEX-PN. The point- biserial analysis failed to show statistically significant associations with any of the interval and ratio independent variables and the dependent variables of practical nursing program persistence/retention and success on the NCLEX-PN.

The independent variables found to have a statistically significant relationship with the dependent variable of nursing program persistence/retention using the Phi coefficient analysis (father ethnicity, gender, receipt of student loans, the taking of some remedial courses [RED 060, RED 080, ENG 060, ENG 080], some of the remedial course grades [RED 060, RED 080, ENG 060, MAT 080], the requirement of a pre-nursing admission exam, and the offering of remediation at the exit point of the nursing program) were included in a logistical analysis. Ten of the 13 independent variables remained in the final model. The three that failed to remain in the final model were RED 060 grade, ENG 060 course, and ENG 060 grade. The Wald criterion demonstrated that only one of the variables made a significant contribution at the significance level of $p < .05$ in predicting graduation/persistence. Receipt of student loans had a significance level of $p = .023$.

The independent variables found to have a statistically significant relationship with the dependent variable of NCLEX-PN success using the Phi coefficient analysis (remedial course grade of RED 080, pre-nursing college GPA, previous biology transferred grade and the offering of remediation at the exit point of the nursing program) were included in a separate logistical analysis. All four variables were retained in the final model; however, the

Wald criterion demonstrated that none of the variables significantly contributed to the model at the significance level of $p = .05$, though pre-nursing college GPA did achieve a probability value approaching significance at $p = .053$.

This chapter described the demographics of the sample used in this study, the characteristics of the findings, and results of statistical inquiry. The next chapter will offer a summary of the topic studied, discussion of findings, conclusions, and recommendations for the future research.

CHAPTER 5: STUDY SUMMARY, DISCUSSION OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

The purpose of this exploratory study was to use logistic regression analysis to identify those variables that would predict persistence in licensed practical nursing programs as well as those variables that would predict successful passing of the NCLEX-PN licensure examination on the first attempt. This final chapter will summarize the topic of study, discuss the study findings, and provide conclusions and recommendations for future research.

Study Summary

According to the AACN (2010), the United States is projected to have a nursing shortage that is expected to intensify as baby boomers age and the need for health care grows. Compounding the problem is that faculty shortages across the country are limiting student capacity at a time when the need for nurses continues to grow. The need for nursing program persistence and first time success on the national nursing exam would help lessen this burden.

Tinto's (1975, 1987, 1993) model of persistence in higher education provided the theoretical framework for this research. Tinto's original model was called the model of dropout from higher education and was later renamed in 1993 as the longitudinal model of institutional departure.

Tinto's model argues that it is the individual's integration into the academic and social systems of the college that most directly relate to persistence in that college. Of those characteristics of individuals shown to be related to dropout, the more important pertain to the characteristics of family, the characteristics of the individual, his/her educational

experiences prior to college entry, and his/her expectations concerning future educational attainment.

This study was solely focused on licensed practical nursing. There is a body of literature that speaks to nursing student success on the NCLEX and a body of literature that speaks to nursing student program persistence. Most of the research published, though, is about registered nursing students.

Seago et al. (2004) report that "...there is little in the literature about the practice, work, demand for, or efficient utilization of the licensed practical nurse. There also is little guidance about how to make effective use of these practitioner's skills to enhance patient care and augment the nurse workforce" (p.3). These same authors report that they were only able to uncover one national survey of licensed practical nurses conducted in 1983; thus, little is known about the practical nursing workforce in the United States, and the data that is available is conflicting.

In the Seago et al. (2004) study, the author's report that hospitals are the dominant employer for licensed nurses; however, RNs are more likely to work in hospitals than are LPNs. A large number of LPNs work in long-term care facilities. Li and Kenward (2006) report that 51.8% of LPNs work in long-term care, 17.5% in community or ambulatory settings, and 25% in hospitals.

Despite this trend, Seago et al. (2004) contend that nursing directors in hospitals report increasing LPN employment in all types of patient units, primarily due to shortages of RNs. This is an attractive hiring option because LPNs cost less to employ than RNs and they can perform higher level skills than nurse aids. LPNs have been historically a necessary part

of the healthcare workforce, and this trend continues as the U.S. population ages, the demands for nursing care increases, and the age of the current nursing workforce increases.

Studies on practical nursing students are limited, however, according to Seago et al. (2004), based on data related to gender, age, marital status, and ethnicity, it appears that LPNs and RNs come from essentially the same pool of potential workers. Conversely, Lamm & McDaniel (2000) and Ostrye (2001) caution against generalizing from RN students to LPN students. They reported that PN students are drawn from a different pool rather than RN students and require their own focused research.

Discussion of Findings

The purpose of this exploratory study was to use logistic regression analysis to identify those variables that would predict persistence in licensed practical nursing programs as well as those variables that would predict successful passing of the NCLEX-PN licensure examination on the first attempt. Research data was collected from a sample of licensed practical nurses who obtained a license to practice nursing in North Carolina between the years of 2000 and 2011.

The predicting variables that were explored were age at program admission, gender, individual and parental ethnicity, level of parental education, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program, the presence of children in the home during the nursing program, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college

GPA, completion of remedial courses/grades, pre-nursing admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit remediation offerings, and final college GPA. Most of these variables have been identified in the literature as affecting persistence and retention rates (Tinto, 1975), as well as NCLEX success (Alexander & Brophy, 1997; Hawsey, 1997; Hereford, 2005; Humphreys, 2008; Porter, 2008).

The dependent variables examined in this study were practical nursing program persistence/retention (defined as graduation upon first attempt in a practical nursing program) and NCLEX-PN success (defined as the successful first attempt at passing the national practical nursing licensure exam). The study addressed the specific questions:

Research Question 1. What is the relationship between the variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, final college GPA) and practical nursing program persistence/retention?

Research Question 2. What is the relationship between the variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades , nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) and NCLEX-PN success?

Research Question 3. What set of variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and

physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) provided the best prediction of practical nursing program persistence/retention?

Research Question 4. What set of variables (age at program admission, gender, individual and parental ethnicity, parental educational level, method of high school completion, high school rank, high school GPA, individual and parental income at program admission, marital status during nursing program enrollment, the presence of children in the home during nursing program enrollment, English as a second language, the language spoken in the childhood home, number of hours worked per week during nursing program enrollment, receipt of monetary educational assistance, college admission testing, pre-nursing college GPA, completion of remedial courses/grades, nursing program admission testing, completion of anatomy and physiology courses/grades, individual nursing course grades, nursing program exit exam/remediation offerings, and final college GPA) provided the best prediction of NCLEX-PN success?

To answer research questions 1 and 2, correlation analysis was used to determine the association between each independent variable and the dependent variables of nursing program persistence/retention and NCLEX-PN results. Appropriate correlation tests were applied as determined by the variable scales of measurement. A Phi coefficient analysis was used to determine the association between nominal independent variables such as gender and the nominal dependent variables of nursing program persistence and NCLEX-PN results. A

Phi coefficient is appropriate when variables are assessed using nominal scales of measurement (Miller, 1998).

A point-biserial analysis was used to determine the association between the interval and ratio independent variables such as age and the dependent variables of nursing program persistence and NCLEX-PN results. The point-biserial correlation is a special case of the Pearson product-moment correlation, but a criterion for the Pearson correlation is that both variables be measured on an interval or ratio level. The nominal categories of the dependent variables do not meet this criterion. A point-biserial analysis is appropriate when one variable (such as age) is continuous and the other variable is nominal (Miller, 1998). Significance for the analyses was established at the 0.05 level of confidence. A significant Phi coefficient or Pearson product-moment correlation would indicate that a statistically significant relationship was found to exist between the independent variable being examined and the dependent variable. Those independent variables that were indicative of a significant relationship with the dependent variable(s) were then tested in a binary logistic regression model.

A logistic analysis technique was used in this study to answer research questions 3 and 4 as there are multiple independent variables, and there is a need to determine the relationship between those variables and a dependent variable. Logistic regression is a specialized form of regression that is formulated to predict and explain a categorical variable (Hair et al., 2006). Logistic regression is appropriate because the variables being studied are nominal in nature (Kerlinger & Lee, 2000; Miller, 1998). Specifically, binary logistic regression analysis was conducted on those variables found to have a significant association

with either the Phi coefficient and or the point-biserial analyses. Binary logistic regression is an appropriate analysis technique to use because there are two dependent variables (Hair et al., 2006).

The independent variables found to have a statistically significant association (using the Phi coefficient analysis) with the dependent variable of nursing program persistence/retention in this study were father ethnicity, gender, receipt of student loans, the taking of some remedial courses (RED 060, RED 080, ENG 060, ENG 080), the grades of some of the remedial courses (RED 060, RED 080, ENG 060, MAT 080), the requirement of a pre-nursing admission exam, and the offering of remediation at the exit exam point of the nursing program. The Phi coefficient analysis also showed a statistically significant association between the independent variables of one remedial reading course grade (RED 080), the biology transferred grade, pre-nursing college GPA, the offering of remediation at the exit exam point of the nursing program, and the dependent variable of success on the NCLEX-PN.

Specifically those respondents who were female tended to have a higher success rate than males, and this is consistent with the findings of Parrish (1994). Students who received student loans had a lower persistence success rate than students who did not receive student loans. Research of the nursing persistence literature did not reveal findings which supported or refuted this finding.

Those respondents whose fathers were White tended to have a higher success rate at program persistence than those who had fathers who were non-White. Though there is nursing program persistence literature which speaks to student ethnicity findings (Maville &

Huerta, 1997; Stickney, 2008), research did not reveal findings which supported or refuted parental ethnicity as a nursing program persistence finding. Respondents who took remedial courses, specifically, RED 060, RED 080, ENG 060, or ENG 080, tended to be less successful in program persistence. This is contrary with the findings of Hawsey (1997) who found that students who had undergone remedial course work prior to nursing program entry had slightly higher graduation rates.

A puzzling finding was that students who were not required to take a pre-nursing admission program exam had a higher program persistence rate than students who were required to take a pre-nursing admission program exam. Equally as puzzling was the finding that students who were offered remediation at the exit point of the nursing program had a lower success rate of persistence than those students who were not offered remediation.

These findings may have been impacted by the sample size and response rate. Of those respondents who said yes (68%, n=105) that a pre-nursing admission program exam was required, only 77 persons listed the type or name of the exam, and less than 50 named an exam that has been identified in the literature as specific to nursing program admission such as the TEAS or HOBET.

Only 64 or 41.8% responded that yes, a passing grade on an exit exam was required, and only 11 or 7.2% responded that remediation was offered. Respondents were asked to list the type of applicable remediation offered, and only 8 persons provided answers which tended to be non-formal in nature such as study guides, class review, or study groups. These were erroneous findings and both merit further attention.

Other independent variables identified in previous studies as being significant in nursing program persistence such as overall college GPA (Campbell & Dickson, 1996), nursing GPA (Campbell & Dickson, 1996; Sayles et al., 2003), science grades (Campbell & Dickson (1996), high school performance measured either as GPA or rank (Porter, 2008; Sayles et al., 2003), age (Maville & Huerta, 1997), and student ethnicity (Maville & Huerta, 1997; Stickney, 2008) were not found to be significant predictors in this study.

Though the variables of father ethnicity, gender, receipt of student loans, the taking of some remedial courses (RED 060, RED 080, ENG 060, ENG 080), the grades of some of the remedial courses (RED 060, RED 080, ENG 060, MAT 080), the requirement of a pre-nursing admission exam, and the offering of remediation at the exit exam point of the nursing program were found to have a statistically significant correlation with nursing program persistence in this study, none of these variables except for the receipt of student loans proved to provide significant contributions in predicting nursing program persistence in the binary logistic regression model.

The independent variables found to have a statistically significant relationship with the dependent variable of NCLEX-PN success were the remedial course grade of RED 080, pre-nursing college GPA, a previous biology transferred grade and the offering of remediation at the exit point of the nursing program. The significance of pre-nursing GPA as a predictor of NCLEX success is consistent with the findings of four previous studies (Hereford, 2005; Wall et al., 1993; Yin, 2003; Young-Richardson, 1996).

Other independent variables identified in previous studies as being significant in the prediction of NCLEX success such as ethnicity (Briscoe & Anema, 1999; Dickey, 1989;

Haas et al., 2004; Hawsey, 1997; Hereford, 2005; Parrish, 1994; Sayles et al., 2003; Thompson, 1989), age (Briscoe & Amena, 1999; Dickey, 1989; Humphreys, 2008; Parrish, 1994; Thompson, 1989), method of high school graduation (Hereford, 2005), high school rank (Wall et al., 1993; Yin, 2003), grades in science courses (Fowles, 1992; Wall et al., 1993; Waterhouse et al., 1994; Yin, 2003), being married rather than being single (Dickey, 1989), family demands, and English as a second language (Arathuzik & Aber, 1998) were not found to be significant predictors in this study.

Though the variables of the remedial course grade RED 080, pre-nursing college GPA, a previous biology transferred grade and the offering of remediation at the exit point of the nursing program were found to have a statistically significant correlation with NCLEX-PN success, none of these variables proved to be significant contributors in predicting NCLEX-PN success in the binary logistic regression model, though pre-nursing college GPA did achieve a probability value approaching significance at $p = .053$.

It is interesting to note that the independent variable of remediation offered at the exit point of the nursing program had a significant correlation with both program persistence and NCLEX-PN success. The findings, however, were surprising in that students who were offered remediation at the exit point of the nursing program had a lower success rate of persistence and a lower rate of success on the NCLEX-PN than those students who were not offered remediation.

These findings may have been impacted by the sample size and response rate. Only 64 or 41.8% responded that, yes, a passing grade on an exit exam was required, and only 11 or 7.2% responded that remediation was offered. Respondents were asked to list the type of

applicable remediation offered, and only eight persons provided answers, which tended to be non-formal in nature such as study guides, class review, or study groups. This was an erroneous finding and merits further attention.

Delimitations and Limitations of Study

Delimitations:

1. This study was delimited to only those LPNs who received a practical nursing license from the North Carolina Board of Nursing between the years of 2000 and 2011.

Limitations:

1. The sample was a convenience sample and, therefore, does not possess the properties of random sampling.
2. The sample size was small; thus, results may not be generalizable beyond the specific population from which the sample was drawn.
3. There was a lack of extensive information like actual scores on preadmission testing and GPAs.
4. This was a self-report study, and lack of candor or recollection of facts may not accurately reflect the actual events or opinions held at the time of nursing program enrollment or the taking of the licensure exam.
5. The two criterion variables are measured as nominal variables. Nominal data is the lowest level of measurement and, therefore, requires nonparametric statistical analysis.

Conclusions

This study was solely focused on licensed practical nursing. There is a body of literature that speaks to nursing student success on the NCLEX and a body of literature that

speaks to nursing student program persistence. Most of the research published, though, is about registered nursing students. The first published study involving practical nursing students was in 1989 with the most recent published in 2008. Most of the studies used available data from the 1990s with only a couple of studies using data from the year 2000. There have not been any studies published using practical nursing data later than 2000 that this researcher was able to uncover.

A review of the literature uncovered 47 studies that sought to identify predictor variables of the likelihood of success on the NCLEX. Ten of those studies involved only practical nursing students, and four of the studies involved both practical nursing students and associate degree students. Nineteen studies involved only associate degree nursing students. Thirteen studies involved only baccalaureate nursing students, and one study involved both associate degree students and baccalaureate degree students. Studies on practical nursing students comprise approximately 30% of this research.

Thirty-nine of the 47 studies used convenience samples, and most were limited to using students from a specific institution or a specific state. Three of the studies did use a national sample. Sample sizes ranged from 8 to 6,800. None of the studies used exactly the same variables to determine the likelihood of success on the NCLEX, but most used a combination of demographic and academic variables such as age, gender, race, income, pre-college or pre-nursing GPA, cumulative GPA, science grades, method of high school completion, use of financial aid, and high school rank/GPA. The statistical methods used in these studies varied; thus, the reporting of the significant predictor variable values varied. None of the studies found the same set of variables to be significant.

Persistence in higher education as well as in nursing programs overall has been a topic of interest for decades. Pantages and Creedon (1978) conducted a literature review from 1950-1975 on college attrition. They reported at that time that four of every ten students who entered college would graduate four years later. Tinto (1993) reported that almost one-half of students entering 2-year colleges and more than one-fourth of students entering 4-year colleges depart at the end of their first year. According to Brawer (1996), approximately 50% of freshmen enrolled in college drop out before completing their program. The U.S. Department of Education (1998) reported that nearly 30% of 1989-1990 beginning students dropped out before the beginning of their second year.

The news just gets bleaker. According to a 2004 report by the U.S. Department of Education, trends in college completion indicate that overall attainment rates have changed little since the early 70s. Tinto and Pusser (2006) report that as of 2005, student persistence rates have not changed very much since the 1980s as approximately six out of ten students do not complete either a 2-year or 4-year degree and only slightly more than 50% of 4-year degree seekers persist.

A review of nursing program persistence literature only uncovered eight studies and four literature reviews that attempted to identify those factors that likely lead to program persistence. Most of the studies used convenience samples from one institution. Four of the literature reviews were on registered nursing students, and five studies were on registered nursing students. Three studies were on practical nursing students which comprise approximately 25% of this research. This body of research covers the years of 1978 through 2010.

This study sought to identify those variables that would predict persistence/retention in licensed practical nursing programs as well as those variables that would predict NCLEX-PN success. The independent variables found to have a statistically significant relationship with the dependent variable of nursing program persistence/retention in this study were father ethnicity, gender, receipt of student loans, the taking of some remedial courses (RED 060, RED 080, ENG 060, ENG 080), the grades of some of the remedial courses (RED 060, RED 080, ENG 060, MAT 080), the requirement of a pre-nursing admission exam, and the offering of remediation at the exit exam point of the nursing program. The independent variables found to have a statistically significant relationship with the dependent variable of NCLEX-PN success were the remedial reading course grade of RED 080, the biology transferred grade, pre-nursing college GPA, and the offering of remediation at the exit exam point of the nursing program.

All of the independent variables found to have a significant correlation with the dependent variables were placed into a logistic regression model corresponding with the appropriate dependent variable. Both logistic models proved to be slightly better fitting models with the inclusion of the independent variables rather than the base model without the independent variables. One logistic model did reveal the receipt of student loans as being a significant predictor of nursing program persistence/retention. The second logistic model failed to produce a set of significant predictors for NCLEX-PN success, though pre-nursing college GPA did achieve a probability value approaching significance at $p = .053$.

Recommendations

The United States is now in the midst of a major nursing shortage that is predicted to get worse over the next ten years (Kurzen, 2005). The Health Resources and Services Administration reports that all 50 states will suffer from a nursing shortage by 2020 (U.S. Department of Health and Human Services, 2004). This means that there will be a shortage of over one million nurses by 2020 (Kuehn, 2007). Nursing shortages create situations where there are not enough nurses to care for patients or enough nurse faculty to educate the next generation of nurses (Erlen, 2001). Erlen goes on to say that individual nurses and patients are feeling the most severe effects of this shortage. Patients and families are becoming aware that there are not enough nurses to provide quality care. There is also research that suggests lower nurse-to-patient ratios are associated with lower rates of hospital acquired infections and deaths (Kane et al., 2007; Unruh, 2003).

The reasons leading to nursing shortages are varied and complex. This study focused on two strategies to help address this major issue. The first strategy was to identify those variables that will predict nursing program persistence/retention, and the second strategy was to identify those variables that will predict NCLEX success on the first attempt. Recruiting and retaining qualified licensed practical nursing students and assisting them to pass the NCLEX on the first attempt will help ease the burden in the health care community.

In light of the paucity of literature regarding practical nursing program persistence and NCLEX-PN performance and the lack of consistent identified student predictors of retention, graduation, and NCLEX success, the nursing profession needs to continue research in this area.

Also missing from nursing research but deemed important by Tinto in educational persistence (1975, 1987, 1993) are the inclusion of family characteristics such as social status and value climates. This study touched on these characteristics by including parental education, parental income, and the language spoken in the childhood home as independent variables. Father ethnicity did surface as a variable having a significant correlation with nursing program persistence.

Student performance on the NCLEX-RN and the NCLEX-PN has important ramifications for administrators, faculty, parents, and students enrolled in nursing programs (Garlough, 2003; Higgins, 2005; Waterhouse et al., 1994). These authors go on to say that the challenge of facilitating success is two-fold. First, an accurate and timely method of prediction of student success is necessary. Once established, early identification of students at risk can occur. After this, the remaining challenge is the identification and accessibility of educational interventions designed to facilitate success on the NCLEX. These authors further posit that wrongful predictions of student success or failure could have adverse effects, ranging from undue emotional stress and test anxiety to altered levels of self-esteem and confidence.

Campbell and Dickson (1996) conducted a ten-year review from 1981 through 1990 of research related to nursing student success and concluded, "The findings of this study indicate the continued inability of nursing research to consistently identify student characteristics predictive of successful retention, graduation, or NCLEX success" (p. 57). They posit that a major challenge for nurse educators today will be to produce a steady flow of nurses to meet the increasing health care needs of our society. Wells (2003) concurs and

says, “The retention of students in nursing programs continues to be a major challenge for nurse educators and deans of nursing programs. Student attrition negatively impacts the needed supply of registered nurses to fill staff, administrative, and teaching positions” (p. 230).

Perhaps future research regarding practical nursing program persistence and NCLEX-PN success should include further study on (a) the impact of receipt of educational financial assistance; (b) the impact of remedial reading, writing, and math courses on persistence and licensure success; (c) the impact of childhood/parental influences; (d) the impact of program exit exams and remediation; (e) the impact of high school academic accomplishments; (f) the impact of college admission tests and testing scores; (g) the impact of nursing program preadmission testing; (h) the impact of standardized testing for NCLEX preparation; and (i) the impact of demographics such as age, ethnicity, employment during nursing program enrolment, marital status, presence of children in the home during nursing program enrollment.

Though large national studies would lend more to the ability to generalize to the entire nursing population, some research (Fowles, 1992) suggests that it may be advantageous for individual colleges to study their own population rather than others to identify persistence trends and NCLEX success rates as student characteristics differ from college to college. It would serve the nursing profession best if both of these areas of research could be expounded. There continues to be a lack of information about PN student persistence and NCLEX-PN success. This study, though limited, hopefully will add to the current body of knowledge.

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APPENDICES

Appendix A

Coding and Level of Data for Demographic/Non-Academic Characteristics

Characteristic	Code	Data Level
Age at admission	1 = 17-21 years 2 = 22-29 years 3 = 30-39 years 4 = 40-49 years 5 = 50+ years	Ratio
Gender	0 = Male 1 = Female	Nominal
Ethnicity	0 = Minority 1 = Nonminority	Nominal
Marital Status	0 = Single 1 = Not Single	Nominal
ESL	0 = English 1 = Non ESL	Nominal
Language Spoken in Childhood Home	1 = Non English 2 = English Plus any other language 3 = English	Nominal
Children Present in Home	0 = No Children Present 1 = Children Present	Nominal
Parental Education Level	0 = No College Degree 1 = Yes College Degree	Nominal
Individual Income	1 = \$10,000 or less 2 = \$10,001 - \$20,000 3 = \$20,001 - \$35,000 4 = \$30,001 - \$50,000 5 = \$50,001 - \$100,000 6 = \$100,001 and above	Ratio
Parental Income	1 = \$10,000 or less 2 = \$10,001 - \$20,000 3 = \$20,001 - \$35,000 4 = \$30,001 - \$50,000 5 = \$50,001 - \$100,000 6 = \$100,001 and above	Ratio
Number of hours worked per week	0 = No hours worked 1 = 1-16 hours worked 2 = 17-23 hours worked 3 - 24-31 hours worked	Ratio

	4 - 32-50 hours worked	
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All data for this research study was self-reported and collected from a sample of North Carolina licensed practical nurses via survey questionnaire.

Age at program admission was coded as 1 = 17-21 years, 2 = 22-29 years, 3 = 30- 39 years, 4 = 40-49 years, and 5 = 50+ years.

Gender – Gender was coded as male = 0 or female = 1.

Ethnicity – Ethnicity was originally coded as 1 for White, 2 for Black, 3 for Hispanic, 4 for Asian, 5 for American Indian, or 6 for other. Ethnicity was later recoded as 0 for minority and 1 for nonminority.

Marital Status – Marital status was initially coded as 1 for single, 2 for living with a partner, 3 for married, 4 for separated, 5 for divorced, 6 for widowed, or 7 for other. Marital status was later recoded as 0 for single and 1 for nonsingle.

ESL was coded as 0 for English as a second language and 1 for non ESL. Language spoken in the childhood home was coded as 3 for English, 2 for English plus any other language, and 1 for non-English.

The presence of children in the home during nursing program enrollment was coded as 0 for no children present and 1 for children present.

Parental educational level was collected for both mother and father. Originally the educational level for each was recorded in varying levels from 1-10 but was later recoded as 0 for no college degree and 1 for college degree.

Annual individual income at time of program admission was coded as 1 for \$10,000 or less, 2 for \$10,001 to \$20,000, 3 for \$20,001 to \$35,000, 4 for \$35,001 to \$50,000, 5 for \$50,001 to \$100,000, and 6 for \$100,001 and above.

Annual combined parental income at time of program admission was coded as 1 for \$10,000 or less, 2 for \$10,001 to \$20,000, 3 for \$20,001 to \$35,000, 4 for \$35,001 to \$50,000, 5 for \$50,001 to \$100,000, and 6 for \$100,001 and above.

The number of hours worked during nursing program enrollment was recorded as 0 for no hours worked, 1 for 1-16 hours worked, 2 for 17-23 hours worked, 3 for 24-31 hours worked, 4 for 32-50 hours worked.

Appendix B

Coding and Level of Data for Academic Characteristics

Characteristic	Code	Level of Data
Method of HS Completion	0 = GED 1 = HS	Nominal
High School GPA	1 = Below D 2 = D 3 = C 4 = B 5 = A	Nominal
High School Rank	1 = Lower 1/3 of Class Rank 2 = Middle 1/3 of Class Rank 3 = Top 1/3 of Class Rank	Interval
Pre-Nursing GPA	0 = Not Applicable 1 = D 2 = C 3 = B 4 = A	Nominal
Receipt of Monetary Educational Assistance/Aid (Scholarship, Financial, Family, Employer, Student Loan)	0 = No Aid 1 = Yes Aid	Nominal
College Admission Testing Required	0 = No College Admission Testing Required 1 = Yes College Admission Testing Required	Nominal
Completion of Anatomy and Physiology Courses (BIO 163, BIO 168, BIO 169, BIO Other Transferred)	0 = No Course Taken 1 = Yes Course Taken	Nominal
Anatomy and Physiology Grades (BIO 163, BIO 168, BIO 169, BIO Other Transferred)	0 = Not Applicable 1 = C 2 = B 3 = A	Nominal
Completion of Remedial Course (RED 060, RED	0 = No Course Taken 1 = Yes Course Taken	Nominal

070, RED 080, RED 090, ENG 060, ENG 070, ENG 080, ENG 090, MAT 060, MAT 070, MAT 080, MAT 090)		
Remedial Course Grades (RED 060, RED 070, RED 080, RED 090, ENG 060, ENG 070, ENG 080, ENG 090, MAT 060, MAT 070, MAT 080, MAT 090)	0 = Not Applicable 1 = C 2 = B 3 = A	Nominal
Nursing Program Admission Testing	0 = Not Applicable 1 = No Testing Required 2 = Yes Testing Required	Nominal
Nursing Program Admission Testing Remediation	0 = Not Applicable 2 = No Remediation Offered 3 = Remediation Offered	Nominal
Nursing Course Grades (NUR 101, NUR 102, NUR 103)	1 = C 2 = B 3 = A	Nominal
Nursing Program Exit Exam	0 = No Exit Exam Required 1 - Exit Exam Required	Nominal
Nursing Program Exit Exam Remediation	1 = Not Applicable 2 - No Remediation Offered 3 - Remediation Offered	Nominal
Final College GPA	1 = D 2 = C 3 = B 4 = A	Nominal

The method of high school completion was coded as 0 for GED and 1 for HS diploma.

High school GPA was coded as 5 for A, 4 for B, 3 for C, 2 for D, and 1 for below D.

High school rank was coded as 3 for top 1/3 of class, 2 for middle 1/3 of class, and 1 for lower 1/3 of class.

Pre-nursing GPA was coded as 0 for not applicable, 1 for D, 2 for C, 3 for B and 4 for A.

Receipt of monetary educational assistance/aid was broken down into 5 categories.

Scholarship aid, financial aid, family aid, employer aid, and student loan aid were all coded as 0 for no aid and 1 for aid.

College admission testing was coded as 0 for no college admission testing and 1 for college admission testing.

Completion of anatomy and physiology courses (BIO 163, BIO 168, BIO 169, and BIO other transferred) were coded as 0 for no anatomy course taken and 1 for yes the course was taken.

Anatomy and Physiology course grades were coded as 0 for not applicable, 1 for C, 2 for B, and 3 for A.

Completion of remedial courses were coded as 0 for no remedial course and 1 for remedial course. Each of the 12 remedial courses were coded separately. Remedial courses included reading, english, and math at the 060, 070, 080, and 090 levels.

Remedial course grades for all 12 courses were coded as 0 for not applicable, 1 for C, 2 for B, and 3 for A.

Nursing program admission testing was coded as 0 for not applicable/don't remember, 1 for no testing required, and 2 for testing required.

Remediation for nursing program admission testing was coded as 1 for not applicable, 2 for none offered and 3 for remediation offered.

Individual nursing course (NUR 101, NUR 102, NUR 103) were coded as 1 for C, 2 for B, and 3 for A.

Nursing program exit exam was coded as 0 for no exit exam required and 1 for exit exam was required.

Remediation for nursing exit exam was coded as 1 for not applicable, 2 for none offered and 3 for remediation offered.

Final college GPA was coded as 1 for D, 2 for C, 3 for B, and 4 for A.

Appendix C

Coding and Level of Data for Practical Nursing Program Persistence and NCLEX-PN

Dependent Variables

Variable	Code	Level of Data
Nursing Program Persistence	0 = Non Persistence 1 = Persistence	Nominal
NCLEX-PN	0 - Fail 1 = Pass	Nominal

Nursing Program Persistence was coded as 0 for non-persistence or did not graduate and 1 for persistence or did graduate.

NCLEX-PN - The NCLEX-PN is a comprehensive national licensing examination for practical nursing graduates. The test is administered by the National Council of State Boards of Nursing (NCSBN). The test measures the competencies needed to perform safely and effectively as a newly licensed, entry-level practical nurse. The NCLEX-PN is a computerized adaptive test. Each candidate must answer a minimum of 85 questions. The maximum number of questions on the examination is 205. Results of the NCLEX-PN are reported as pass or fail. This data was recorded as 0 for did not pass the NCLEX-PN on the first attempt or 1 for did pass the NCLEX-PN on the first attempt.

Appendix D

Data Collection Form

Subject Code: _____ Year entered _____ Year graduated _____

Yr Readmit _____

Age: _____ Ethnic Background: _____ 1=White, 2=Black, 3=Hispanic,
4=Asian, 5=American Indian, 6=other

Gender: _____ 0=M, 1=F

Method of High School Completion: _____ 0=GED, 1=HS

Marital Status: _____ 0=Married, 1=Not Married

ESL: _____ 0=ESL, 1=Non ESL

Receipt of Financial Aide: _____ 0=Financial Aide, 1=No Financial Aide

High School GPA: _____ Pre-Nursing GPA: _____ Nursing Program GPA: _____

Reading Assessment: _____ Writing Assessment: _____ Math Assessment: _____

Compass: _____ Compass: _____ Compass: _____

Asset: _____ Asset: _____ Asset: _____

Not Taken: _____ Not Taken: _____ Not Taken: _____

Anatomy and Physiology Grade: _____ A=93-100, B=85-92, C=77-84, D=70-76,
F=0-69

Completion of Remedial Courses: A=93-100, B=85-92, C=77-84, D=70-76, F=0-69

Reading Grade: _____ NA: _____

Writing Grade: _____ NA: _____

Math Grade: _____ NA: _____

Nursing Program Persistence: _____ 1=Pass, 2=Fail

NCLEX-PN: _____ 1=Pass, 2=Fail

Appendix E

Copy of Internet Survey Questionnaire

Practical Nursing Education Survey

*** 1. What was your method of highschool graduation?**

- GED
- High School Diploma

***2. If applicable what was your highschool GPA?**

- A average
- B average
- C average
- D average
- Below D
- NA

***3. If applicable what was your highschool rank?**

- Top 1/3 of class
- Middle 1/3 of class
- Lower 1/3 of class
- Don't remember
- NA

***4. What is your ethnic background?**

- White
- Black
- Hispanic
- Asian
- American Indian

Other (please specify)

Practical Nursing Education Survey

* 5. What is/was your mother's ethnic background?

- White
- Black
- Hispanic
- Asian
- American Indian

Other (please specify)

* 6. What is/was your father's ethnic background?

- White
- Black
- Hispanic
- Asian
- American Indian

Other (please specify)

* 7. What is your gender?

- Female
- Male

* 8. What was your marital status at the time you started your first actual practical nursing course?

- Single
- Living with a partner
- Married
- Separated
- Divorced
- Widowed

Other (please specify)

Practical Nursing Education Survey

*** 9. Did you have children living with you for which you were responsible for during your educational time in the practical nursing program?**

- Yes
- No

Other (please specify)

*** 10. What was your average gross yearly income prior to entering the practical nursing program?**

- \$10,000 or less
- \$10,001 to \$20,000
- \$20,001 to \$35,000
- \$35,001 to \$50,000
- \$50,001 to \$100,000
- \$100,001 or more

*** 11. What was your parent's average combined yearly income prior to you entering the practical nursing program?**

- \$10,000 or less
- \$10,001 to \$20,000
- \$20,001 to \$35,000
- \$35,001 to \$50,000
- \$50,001 to \$100,000
- \$100,001 or more

Practical Nursing Education Survey

*** 12. What if any was the type of financial assistance you received to attend practical nursing school?**

- Scholarship
- Financial Aid
- Assistance from family/others
- Employer assistance
- Student loans
- NA

Other (please specify)

*** 13. What is the highest level of school your mother completed or the highest degree she received?**

- Less than high school degree
- High school degree or equivalent (e.g., GED)
- Some college but no degree
- Associate degree
- College post associate degree
- Bachelor degree
- College post bachelor degree
- Masters degree
- College post masters degree
- Doctoral degree

Other (please specify)

Practical Nursing Education Survey

*** 14. What is the highest level of school your father completed or the highest degree he received?**

- Less than high school degree
- High school degree or equivalent (e.g., GED)
- Some college but no degree
- Associate degree
- College post associate degree
- Bachelor degree
- College post bachelor degree
- Masters degree
- College post masters degree
- Doctoral degree

Other (please specify)

*** 15. Is English your first or second language?**

- First
- Second

Other (please specify)

*** 16. Please describe what language(s) were primarily spoken in your childhood home.**

*** 17. What was your age at the time you were accepted into your first practical nursing program?**

*** 18. Which college admission test did you have to complete?**

- Asset
- Compass
- NA

Other (please specify)

Practical Nursing Education Survey

*** 19. What if any remedial reading course did you have to complete?**

- RED 060
- RED 070
- RED 080
- RED 090
- NA

*** 20. What if applicable was your reading letter grade?**

RED 060	<input type="text"/>
RED 070	<input type="text"/>
RED 080	<input type="text"/>
RED 090	<input type="text"/>
NA	<input type="text"/>

*** 21. What if any remedial english course did you have to complete?**

- ENG 060
- ENG 070
- ENG 080
- ENG 090
- NA

*** 22. What if applicable was your english letter grade?**

ENG 060	<input type="text"/>
ENG 070	<input type="text"/>
ENG 080	<input type="text"/>
ENG 090	<input type="text"/>
NA	<input type="text"/>

*** 23. What if any remedial math course did you have to complete?**

- MAT 060
- MAT 070
- MAT 080
- MAT 090
- NA

Practical Nursing Education Survey

* 24. What if applicable was your math letter grade?

MAT 060

MAT 070

MAT 080

MAT 090

NA

* 25. Which biology course(s) did you take?

BIO 163

BIO 168

BIO 169

Previous biology transferred

Other (please specify)

* 26. What was your letter grade in the applicable biology courses?

BIO 163

BIO 168

BIO 169

Other BIO

* 27. What was your college GPA just prior to entering the nursing program?

A average

B average

C average

D average

Other (please specify)

* 28. What month and year did you first enter a practical nursing program?

* 29. Did you have to pass a pre-nursing admission exam?

Yes

No

Practical Nursing Education Survey

* 30. What if applicable was the name of the pre nursing admission exam?

* 31. If passing was required on the pre nursing admission exam and you did not pass, was remediation offered?

- Yes
- No
- NA

Other (please specify)

* 32. If applicable what type of remediation was offered?

* 33. If applicable how many average hours per week did you work while in the practical nursing program?

* 34. If applicable what month and year did you graduate from your first attempt in a practical nursing program?

* 35. If you did not graduate on your first attempt in a practical nursing program, what do you feel most attributed to you not being able to complete the program?

- Family obligations
- Financial
- Academically not ready
- Work obligations
- Health reasons
- NA

Other (please specify)

Practical Nursing Education Survey

* 36. If you were unable to complete the practical nursing program on the first attempt, were you able to complete it on the second attempt?

- Yes
- No
- NA

* 37. If you were unable to complete the practical nursing program on the second attempt, what do you feel most attributed to you not being able to complete the program?

- Family obligations
- Financial
- Academically not ready
- Work obligations
- Health reasons
- NA

Other (please specify)

* 38. If you were able to complete the practical nursing program on the second attempt, what month and year did you graduate?

* 39. Did you have to take an exit exam prior to graduating from the practical nursing program?

- Yes
- No

* 40. If yes, what was the name of the exit exam?

* 41. Did you have to make a passing grade on the exit exam to graduate?

- Yes
- No
- NA

Practical Nursing Education Survey

*42. If you had to take and or pass an exit exam, was remediation offered?

- Yes
- No
- NA

*43. If remediation was offered, what type of remediation was offered?

*44. What was your letter grade in NUR 101?

*45. What was your letter grade in NUR 102?

*46. What was your letter grade in NUR 103?

*47. What was your final college GPA upon graduation from the nursing program?

- A average
- B average
- C average
- D average

*48. If you took and passed the NCLEX-PN exam on the first attempt, what reason do you attribute most to being successful on that first attempt?

*49. If you were unable to pass the NCLEX-PN on the first attempt, what reason do you attribute most to being unsuccessful?

Practical Nursing Education Survey

50. What comments if any do you have on the subject of practical nursing education retention, the ability to graduate from a practical nursing program or on the potential of passing the NCLEX-PN on the first attempt?