RELATIONSHIP AMONG MOSBY'S ASSESS TEST SCORES, ACADEMIC PERFORMANCE, AND DEMOGRAPHIC FACTORS AND ASSOCIATE DEGREE NURSING GRADUATES' NCLEX SCORES

DISSERTATION

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements

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By

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This ex post facto study sought to examine: the efficacy of *Mosby's Assess Test* as a valid predictor of NCLEX (National Council of State Boards of Nursing Licensure Examination) scores; significant correlations among semester averages, semester tests failed, *Nelson Denny Reading Test* scores, and NCLEX scores; and differences in NCLEX outcomes in relation to ethnicity, age, and prior practical nursing licensure for 558 associate degree nursing graduates who wrote the NCLEX in 1983 and 1984. Significant positive relationships were found among Mosby scores, Nelson Denny scores, semester averages, and NCLEX scores. A significant negative relationship was found between number of semester tests failed and NCLEX scores. The mean NCLEX score of older graduates was higher than the mean NCLEX score of younger graduates. LPN graduates had a higher mean NCLEX score than non-LPN graduates. White graduates' mean NCLEX score was greater than the average score for black graduates. Combined predictor variables which yielded the best estimate of the criterion variable (NCLEX scores) for all graduates
included mean semester average, Mosby scores, age above thirty-three, and Nelson Denny scores, respectively. The most important predictor of black graduates' NCLEX success was prior practical nursing licensure. Other significant predictors for black graduates' NCLEX success were mean semester average, Mosby scores, mean number of semester tests failed, age above thirty-three, and Nelson Denny scores, respectively. Mean semester average, mean score of the Mosby test, mean number of semester tests failed, and age above thirty-three were the most significant predictors of white graduates' NCLEX success. Older graduates had a higher mean Mosby score, a higher mean semester average, and failed fewer semester tests than younger graduates. The study results will be of interest to nurse educators and counselors who are concerned with curricular revision, student counseling, and remediation procedures as these relate to enhancement of graduates' potential for success on the NCLEX.
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CHAPTER I

INTRODUCTION

In order to be licensed to practice as a registered nurse in the United States, graduates of nursing programs must achieve a minimum passing score on a national state board examination for evaluation of safety and competence upon entry into practice. Nursing schools must maintain a minimum program passing percentage in order to maintain full program approval by the Board of Nurse Examiners for the State of Texas.

In the past decade, major changes have been occurring in nursing education which are affecting curricular and licensure practices. Central among these changes are varying enrollment patterns and changes in the roles, functions, and scope of nursing practice. Moreover, increasingly large numbers of culturally diverse adults are enrolling in college to advance education, to further careers, and to qualify for work in growth industries, such as health care, as the economy accelerates its shift from manufacturing to service work (Fabayo 1980; Felts 1986; Francese 1984; Johnson 1981). In response to changing societal health care and professional needs, nursing is becoming more specialized, diversified, and autonomous. In response to these changes, nursing
education is adapting to cultural needs and to needs of adults who have family, job, and community responsibilities. Curricular and licensure changes are being implemented to reflect professional progress.

In 1982, a major change occurred in the national licensure examination. The former State Board Test Pool Examination (SBTPE), which had been administered in every state to nursing graduates since 1950, became the new National Council of State Boards of Nursing Licensure Examination (NCLEX). The new instrument evidences changes in focus, format, and scoring (Smeltzer 1982). Unlike the SBTPE, which focused on recall of disease-related facts and produced five separate scores according to the medical model, the NCLEX outcome is one integrated score based on analysis and application of nursing behaviors in problem-solving situations according to the nursing process.

Standardized achievement tests changed to correspond to the new NCLEX focus and format. One of these, the new Mosby's Assess Test, is currently used as a measure of curricular achievement and as a predictor of NCLEX performance (Saxton et al. 1983).

The new examinations, a changing learner population, and a changing profession all have implications for nursing education and research. Present and future investigations are needed to analyze correlations between the new test
scores and to explore academic and demographic variables in relation to NCLEX performance.

This study arose from the desire of a north Texas associate degree school of nursing to identify factors which relate to a decline in graduates' performances on the new NCLEX in 1983 and 1984. The new Mosby's Assess Test, academic achievement, demographic factors, and prior practical nursing educational experience were selected as the variables to be studied in relation to predicting graduates' success on the NCLEX.

**Statement of the Problem**

This study was concerned with examining relationships of Mosby's Assess Test outcomes, academic performance, and demographic factors to associate degree nursing graduates' scores on the new National Council of State Boards of Nursing Licensure Examination.

**Purposes of the Study**

The purposes of this study were to (1) examine the validity of the new Mosby's Assess Test as a predictor of associate degree nursing graduates' performance on the new National Council of State Boards of Nursing Licensure Examination, (2) examine the relationship between associate degree nursing graduates' academic performance variables and performances on the new licensure examination, and
(3) investigate the relationship between associate degree nursing graduates' demographic variables and performances on the new licensure examination.

Hypotheses

To carry out the purposes of the study, the following hypotheses were tested.

1. There will be a significant positive relationship between achievement as measured by total scores of the new Mosby's Assess Test and practice performance competency as measured by total scores of the new National Council of State Boards of Nursing Licensure Examination (NCLEX) for four groups of graduates of one National League for Nursing (NLN) accredited community college associate degree nursing program.

2. There will be a significant positive relationship between nursing graduates' semester numerical averages and reading entrance examination scores and total scores of the NCLEX.

3. There will be a significant negative relationship between the number of unit tests failed each semester and the total scores of the NCLEX.

4. There will be a significant difference in performance as measured by scores on the NCLEX of nursing graduates (a) age eighteen to thirty-two and (b) age
thirty-three and over. The direction of the difference will be: Group b > Group a.

5. There will be a significant difference in performance as measured by scores on the NCLEX of nursing graduates who (c) are Licensed Practical Nurses and (d) are not Licensed Practical Nurses. The direction of the difference will be: Group c > d.

6. There will be a significant difference in performance as measured by scores on the NCLEX of (e) black nursing graduates and (f) white nursing graduates. The direction of the difference will be: Group f > e.

Significance of the Study

In the past, several studies have been implemented in response to nursing educators' concerns regarding impacts of state board examination performance on individual licensure and program accreditation and approval. These studies, summarized by Bell and Sanchez (1980), focused on the variables of academic achievement, demographic data, and results of former NLN standardized achievement tests as these predicted former State Board Test Pool Examination (SBTPE) scores.

Such predictions, based on outcome correlations of now-obsolete examinations, can no longer be assumed. Administration of the new Mosby's Assess Test and the new National Council Licensure Examination (NCLEX) negates past
research results and the validity of formerly-determined SBTPE performance predictors. These changes, in addition to new developments relating to professional practice entry level and a current trend toward older, culturally diverse student populations, necessitate investigations of new test score relationships and performance differences among nursing graduates. Significant findings will enable nursing educators to develop tools to differentiate between potentially successful students and those who need remediation. Faculty and counselors need information to assist them in selection and counseling of students, in determining remediation needs, and in program evaluation (Mix 1984).

This study proposed to investigate new test score relationships and performance differences among nursing graduates in order to establish a database regarding the relative efficacy of Mosby's Assess Test as a valid predictor of NCLEX performance and to provide vital data to assist counselors and faculty in curricular revision and in areas of student admission, counseling, and remediation. Specifically, the study sought to provide nursing education a new baseline from which to (1) identify student learning needs related to the nursing process, (2) counsel students regarding identified learning needs in relation to NCLEX performance, (3) plan and implement study or review relevant to student learning needs, (4) analyze and evaluate curricular theoretical and
practical content for deficits in identified need areas, and (5) revise programs and practices according to curricular evaluation.

**Definition of Terms**

The following terms have restricted meaning and were thus designed for this study.

**Associate degree nursing student** is one who is preparing for registered nurse licensure and is enrolled in the freshman or sophomore year of a community-junior college-based nursing curriculum.

**Associate degree nursing graduate** is one who has successfully completed the requirements of a junior or community college for an associate degree in nursing and who has written the national registered nurse licensure examination.

**Mosby's Assess Test** (instrument measuring predictor variable) is a national, comprehensive, standardized test which is written, validated, normed, and scored by the C. V. Mosby Company, and which measures nursing content knowledge related to the nursing process and nursing program objectives.

**National Council of State Boards of Nursing Licensure Examination (NCLEX)** (instrument measuring criterion variable) is a standardized, validated, nationally normed, comprehensive licensure examination for evaluation of minimal
competency upon entry into professional nursing practice. The examination is developed by the National Council of State Boards of Nursing (NCSBN), produced and scored by the California Testing Bureau of McGraw Hill, and administered by each nursing state board.

**Licensed practical nurse** is one who has completed a twelve- to eighteen-month vocational nursing course and has been licensed as a vocational or practical nurse prior to enrolling in and completing the associate degree nursing program.

**Nelson Denny entrance examination** (instrument measuring predictor variable) is a national, standardized, validated examination which measures reading vocabulary and comprehension.

**Unit tests** are tests given each semester which averaged for a final semester grade.

**Semester averages** are averages of unit tests in each of four semesters.

**Academic achievement** consists of scores on the Nelson Denny (Form C) entrance examination, number of unit tests which are failed each semester, and four semester averages.

**Limitations**

The following was considered a limitation in this study: Correlational investigations are limited to
discovery or clarification of relationships between two or more variables; therefore, no cause-effect relationships can be established.

**Delimitations**

1. In order to establish a basis for generalization of findings, the study was delimited to subjects from an NLN accredited associate degree nursing program.

2. As the new Mosby's Assess Test and the Nelson Denny Reading Test scores were predictor variables to be investigated, generalization of study outcomes is delimited to associate degree nursing programs administering these tests.

3. The mathematics entrance examination utilized by the nursing program was not a reliable, standardized, validated test; therefore, scores from this examination were not used as a predictor variable in this investigation.

**Assumptions**

The assumptions basic to this study were the following.

1. The subjects in this study were not a homogeneous group.

2. All subjects in the study were not equally capable intellectually, nor similarly interested, nor similarly motivated.
3. All subjects had equal opportunities to achieve all that the nursing curriculum offered.

4. The NCLEX is a valid and reliable instrument for measuring competency level upon entry into practice.

5. Mosby's Assess Test and the Nelson Denny Reading Test are valid and reliable instruments for measuring entrance competencies and achievement in nursing school.

6. It is possible to identify academic achievement basic to each nursing level or semester.

7. Subjects were representative of the participating program.

8. Examination performances of subjects from a nationally accredited United States associate degree nursing program reflect performances of all similarly educated nursing students and graduates in the United States.

9. Curricular programs and practices in nationally accredited United States associate degree nursing programs are implemented and evaluated according to standards and criteria outlined by the National League for Nursing (NLN).

The Population

The population consisted of 558 associate degree nursing graduates from one National League for Nursing accredited Texas community college program who wrote the National Council of State Boards of Nursing Licensure Examination (NCLEX) in 1983 and 1984. The heterogeneous
population included graduates who varied in age, ethnicity, and educational background.

This study sought to identify academic and demographic variables which related to a decline in graduates' performances on the NCLEX from January, 1983 through July, 1984. Four subgroups of graduates who took the NCLEX were utilized in the investigation: 71 in January, 1983; 201 in July, 1983; 102 in January, 1984; and 184 in July, 1984. The July, 1984, subgroup included 110 from a central campus and 74 from a satellite campus. Each group had the same program admission criteria and curriculum, and all subjects who wrote the Mosby standardized achievement test were administered the test in their final semester immediately prior to graduation from the program and within two months of writing the NCLEX.

Of the 558 subjects, more than half in each subgroup were adults, age 25 and over. In each subgroup, approximately 20 percent were Licensed Practical Nurses, 80 percent were white, and 20 percent were black.

Organization of Remaining Chapters

The focus of this study was to establish correlations among nursing graduates' scores on a new assessment test, academic achievement variables, demographic factors, and scores on a new licensure examination. The stated purpose was to provide information vital to future licensure
examination performance predictions and to provide nursing education a valid and new foundation from which to enable graduates' licensure success, to revise curricular programs and practices, and to initiate future research. A review of related literature in Chapter II is divided into sections according to the investigational hypotheses. The procedures for the collection of data are reported in Chapter III. An analysis of the data is presented in Chapter IV. Chapter V includes a summary of major findings, conclusions, implications, and recommendations for future research.
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CHAPTER II

SYNTHESIS OF RELATED LITERATURE

Introduction

The following literature review is arranged in sections corresponding to the study hypotheses. The first section presents an overview of former and new state board test plan foci and nursing achievement tests as performance predictors. The new Mosby's Assess Test as a state board performance predictor is discussed in the second section. The remaining sections explore academic achievement, age, prior practical nursing education, and ethnicity as variables influencing licensure examination performance.

SBTPE, NCLEX, and Nursing Achievement Tests as Performance Predictors

In 1944, a national registered nurse state board examination was developed by what is now the National League for Nursing (NLN). By 1950, all states had adopted the examination as a measure of minimal competency or safety upon entry into professional nursing practice (Shannon 1974).

Since a 1952 major revision, the national test has been known as the State Board Test Pool Examination (SBTPE) for registered nurses. For thirty years, the format of
the SBTPE has been patterned after the medical model, which includes specialty divisions of medicine, surgery, obstetrics, pediatrics, and psychiatry. Thus, for more than twenty-five years, nursing graduates have written a licensure examination consisting of five separate nursing tests in these specialty areas. The focus of the SBTPE has been primarily simple recognition or recall of factual knowledge related to disease states or pathophysiology, and the test plan has been based on ability categories, such as "understands medical care and nursing theory" (Council of State Boards of Nursing 1979, Smeltzer 1982).

Each of the five tests has consisted of 90 to 125 multiple choice questions which included four options from which to select the "best" answer. In order to pass the normative-referenced SBTPE, each candidate had to pass each of the five tests with a standard score of 350, which, based on a mean of 500 and a standard deviation of 100, was 1.5 standard deviations below the mean. Candidates who failed one or more of the five tests were not licensed to practice professional nursing and were required to retake the failed test(s) during the next bi-yearly examination administration (Council of State Boards of Nursing 1979, Smeltzer 1982).

In 1979, a new state board test plan was accepted by the Council of State Boards of Nursing within the American Nurses' Association, and in 1980, the council
was succeeded by the National Council of State Boards of Nursing (NCSBN). The NCSBN completed the development of the test plan and the new licensure examination, which was administered for the first time in July, 1982. The test, entitled the National Council of State Boards of Nursing Licensure Examination (NCLEX), is no longer based on the medical model and no longer consists of five separate specialty sections. The new format is one test based on the five categories of the nursing process—assessing, analyzing, planning, implementing, and evaluating, and the test items are written to reflect the applicant's abilities to think critically or analyze situations, to synthesize information, and to apply learning in problem-solving client care processes. Rather than focusing on recall of factual, disease-oriented information, the NCLEX emphasizes higher-level cognitive functions of analysis and application in relation to the nursing process (Pardue 1979; Smeltzer 1982).

The new conceptually-based test structure includes systems of client health requirements. These are represented in test items as locus of control, or locus of decision-making in relation to client needs. Depending on the client's health status and self-care abilities, health care decisions may be made by the nurse, by the client, or by the nurse and client in collaboration. The test examines
nursing behaviors in situations requiring knowledge of normal growth and development (the life cycle); basic human needs; coping mechanisms; actual and potential health problems; the effects of sex, age, culture, ethnicity, and religion on health needs; communication skills; illness prevention; and management (Kneisl 1983).

Nursing behaviors tested are validated by critical incidents, which are criteria specified for safe and effective nursing practice. Based on the organizing framework of the nursing process, the objective test items require the licensure candidate to respond to realistic clinical nursing situations by selecting answers which represent appropriate behaviors in assessment (establishing client health data), analyzing (specifying client problems and needs and formulating client care goals), planning (formulating strategies to achieve goals), implementing (carrying out nursing behaviors to accomplish identified goals), and evaluating (determining goal achievement). These behaviors are tested in a two-day, four-part, comprehensive examination. As the four parts compose one test, the candidate receives one standard score. If a candidate fails to score a minimum of 1600 on the new examination, the entire test must be retaken and passed in order to obtain licensure (Jacobs, Fivars and Fitzpatrick 1982; Smeltzer 1982).
As individual licensure and nursing school program approval depend on state board examination results, scores on these tests are major concerns of licensure candidates and nurse educators. Searches for predictors of performance on the former **State Board Test Pool Examination** (SBTPE) have resulted in evidence supporting factors such as SAT verbal scores (Backman and Steindler 1971; Miller, Feldhusen and Asher 1968; Reed and Feldhusen 1972), nursing theory grades (Dubs 1975), cumulative grade-point average (Jones 1977; Reed and Feldhusen 1972), and ACT scores (Carse 1984; Jones 1977; Juarez 1978; Perez 1977) as fair predictors of licensure examination outcomes.

The most consistent predictors found have been scores or outcomes of National League for Nursing (NLN) achievement tests. Studies from 1966 (Brandt, Hastie and Schumann) to 1980 (Erickson; Washburn) have investigated correlations between NLN test subscores and former SBTPE subscores. Papcum (1971) correlated eight NLN achievement test scores with each of the five SBTPE subtest scores and found all correlations to be significant at the .05 level, with positive correlations ranging from .33 to .77. These results were limited for purposes of generalization, as the study was limited to one class of twenty-three students. In a four-year study involving 101 students, Bell and Martindill (1976) found high correlations, ranging from
.64 to .81, between NLN and SBTPE scores. This study is significant not only because of the correlations, but also because the results supported the utilization of regression equations in the prediction of student SBTPE performance.

In addition, these investigators suggested that the utilization of NLN test scores as tools for guiding students' preparation for state board examinations could increase the number of students passing the tests.

Deardorff, Denner, and Miller (1976) also developed regression equations and found that three NLN subscores consistently predicted former SBTPE performances of graduates of a midwestern associate degree nursing program from 1969 to 1974. These investigators concluded that predictions based on NLN raw scores were more stable than predictions based on percentage scores. This finding contributed credence to findings of an earlier study (Baldwin, Mowbray and Taylor 1968) which supported utilization of raw scores.

In a promising national study involving 12,552 graduates of 314 schools of nursing in 45 jurisdictions in the United States (Katzell 1970), correlations between scores on NLN achievement tests and SBTPE scores were significant at the .01 level. Other investigation results (Coher 1975; Erickson 1980; King 1978; Krupa 1983; Mix 1984; Mueller and Lyman 1969; Muhlenkamp 1971; Neofotist 1981; Shelley, Kennamer and Raile 1976; Washburn 1980) have
revealed positive correlations between NLN achievement test scores and SBTPE outcomes.

Despite acknowledged limitations in many of these studies, all of the findings have contributed support for utilization of nursing achievement test scores in prediction of state board examination performance. Several investigators, including Breyer (1984), Erickson (1980), Shelley et al. (1976), and Washburn (1980) have acknowledged that such scores are useful in assessment of students' strengths and limitations, in reviewing and evaluating curricula, and in developing corrective learning activities for students preparing for the licensure examination.

For the past decade, nurse educators and licensure candidates have relied on former achievement test scores to indicate SBTPE performance; however, these indicators are no longer valid. New, comprehensive achievement tests have been developed and the former SBTPE has been replaced by a completely new and different state board examination—the NCLEX. Erickson (1980) and Washburn (1980) assert that new research, designed to investigate predictors of performance on the new NCLEX, is indicated.

Mosby's Assess Test as NCLEX Performance Predictor

The new Mosby's Assess Test is a comprehensive nursing achievement examination administered to graduating
nursing students. The test blueprint (plan, focus, format, content, administration, and scoring) simulates and follows the blueprint of the NCLEX. Detailed information related to the Mosby's Assess Test is presented in this study in the section entitled "Instruments."

A review of current literature revealed only one published pilot study (Wisenbaker and Lee 1985) to determine the efficacy of the Mosby's Assess Test as a predictor of NCLEX performance. These investigators found a strong positive correlation ($r = .67, p < .001$) between scores of the Mosby's Assess Test and the NCLEX, acknowledged a less than perfect correlation, and concluded that the use of "cut off" scores in prediction is not justified. Investigative outcomes in one unpublished study (Michaels 1984) support the Mosby test as a reliable predictor of NCLEX success. The investigator found a significant positive relationship (correlation coefficient .76 at the .01 level) between raw scores on the two examinations.

Michaels (1984) reported that a raw score of 230 or above on the Mosby's Assess Test correlated with a passing score of 1600 on the NCLEX for the study sample of 108 graduates of one community college associate degree nursing program. The investigator recommended: (1) that graduating students be given extensive orientation to the Mosby's Assess Test prior to the examination in order to ensure
awareness of the test's significance; and (2) that nursing faculty discuss individual test results with each graduating student and recommend review of specified areas of weakness prior to the NCLEX examination. In addition, Michaels recommended further studies to validate the relationship between the two test outcomes.

**Academic Achievement Variables Influencing Licensure Examination Performance**

This section examines nursing students' semester averages, reading and mathematics entrance examination scores, and semester unit test performance as these factors relate to performance on the former State Board Test Pool Examination (SBTPE) and the new National Council of State Boards of Nursing Licensure Examination (NCLEX). The literature revealed no study findings which correlate licensure examination outcomes with Nelson Denny Reading Test scores or nursing students' semester unit test results (students who achieve the minimum passing semester average, but who fail one or more unit tests during the semester). As the following literature review reveals, investigative outcomes relating to reading and mathematics entrance examination performance were presented in terms of various national and nursing standardized preadmission verbal and quantitative scores, and semester averages were referenced as nursing theory course grades.
Searches for predictors of state board test performance have resulted in evidence of significant positive relationships between successful nursing program and former licensure examination outcomes and: (1) SAT verbal scores (Backman and Steindler 1971; Bain 1974; Bell and Sanchez 1980; Frierson 1986; Miller et al. 1968; Payne and Duffey 1986; Quick 1985; Raderman and Allen 1974; Reed and Feldhusen 1972); (2) ACT social science reading scores (Seither 1980); (3) Davis Reading Speed Test scores (Hultquist 1981); (4) National League for Nursing (NLN) vocabulary and reading ability measures (Berry 1980; Di Marco and Norton 1979); and (5) California Reading Test outcomes (Seither 1974). Schoenfisch (1983) identified SAT quantitative scores as significant contributors to NCLEX success, and Quick (1985) revealed evidence of higher mean SAT mathematics scores among graduates who passed the NCLEX. Several investigators (Berry 1980; Hultquist 1981; Schoenfisch 1983) acknowledged the importance of verbal and quantitative abilities to licensure examination performance success, and recommended that further studies be conducted in order to provide nursing programs with a valid base from which to formulate admission criteria and implement student counseling.

Unlike the conclusion of Baldwin et al. (1968) that classroom grades in theory courses were not good predictors
of state board test performance, recent study outcomes have revealed positive correlations between nursing theory course grades, nursing major test scores, and SBTPE-NCLEX success (Carse 1984; Krupa 1983; Quick 1985; Reed and Feldhusen 1972; Seither 1980; Whitley and Chadwick 1986). Dubs (1975) also identified a high positive correlation (.85 at the .001 level of significance) between nursing theory grade averages and SBTPE score averages, and concluded that theory grades and nursing grade-point average are the best predictors of success on state board examinations. These findings are in agreement with results of a study by Shelley et al. (1976) which evidenced significant correlations between grades in fundamentals of nursing and scores of four SBTPE subsections. Yocom and Scherubel (1985) supported these study outcomes in their presentation of significance differences evidenced between levels of course work performance demonstrated by students who passed the SBTPE and those who failed at least one subtest. Grade differences of "B" to "C" were present in all nursing theory courses, and these differences were repeated in yearly and cumulative grade-point averages. These investigators, like Brandt et al (1966), Millican (1986), Muhlenkamp (1971), and Woodham and Taube (1986), have acknowledged nursing theory grades as useful predictors of state board results. Glick, McClelland, and Yang (1986) found the prenursing
grade-point average and biology grade-point average to be the best predictors of licensure examination success.

Age and Licensure Examination Performance

As a result of the post-World War II "baby boom," an "adult boom" exists in higher education enrollment. Since 1962, increasing numbers of learners entering nursing are adult students over the age of twenty-five. This trend has resulted in nurse educators' increasing interest in understanding how adults learn and perform, and in providing learning experiences which meet adult needs (Aldag and Rose 1983; Johnson 1981). A review of literature relating to adult learning needs and capacities provides information relevant to a changing student population and performance on the new state board examination.

Cross (1981), Knowles (1978), and Zemke (1981) explain changes in intellect which occur in the process of developing throughout the lifespan. These authors explain that, in youth, a dominant fluid intellect enables youthful capacities to react quickly, to store large amounts of information in short-term memory, and to rapidly process a vast quantity of necessary, but fragmented, new information. As the individual matures, the writers continue, fluid intellect declines and crystallized intelligence, an adult strength related to vocabulary, verbal ability, general
information, and conceptual knowledge, develops. A progressively dominant crystallized intellect leads to wisdom and problem-solving abilities based on combined knowledge and experience. Implied in andragogy, a theory of adult education (Knowles 1978), is a positive relationship between age, or maturity, and abilities to reason, analyze, interpret, integrate knowledge, make decisions, and apply learning in problem-solving situations.

Several studies reported in the literature support Knowles' implied relationship. Aldag and Rose (1983), Carse (1984), Froman and Owen (1984), Jones (1977), Miller et al. (1968), Miller and Meier (1974), and Seither (1974) correlated age with state board examination performance and found positive relationships between increased age and increased SBTPE scores. Bain (1974) found that older students are more likely to score higher on the state board examination than younger students. In this study's findings regarding age and SBTPE performance, the correlation coefficient increased as the age of the student increased. Like Bain, Quick (1985) found that older graduates had higher passing rates than younger graduates on both the SBTPE and the NCLEX. Rush and Belock (1986) found that older nursing students scored higher than younger students on the College Level Academic Skills Test (CLAST) which assesses basic level skills in reading comprehension,
writing, conceptualizing, and analyzing. These investigators also reported a significant positive correlation between CLAST and licensure examination scores.

Reed and Feldhusen (1972), in a validation and cross-validation study of five SBTPE subscores using twenty-six predictor variables, found the highest positive correlation (.69 at the .05 level of significance) between both age and SAT verbal scores and the psychiatric nursing subscore. Brandt et al. (1966) hypothesize that (1) psychiatric information is difficult to elicit in formal testing methods, and (2) a different type of ability is needed for success in psychiatric nursing as opposed to abilities required for success in other nursing categories.

Raderman and Allen (1974), in comparing students who obtained degrees and those who did not, found that students who successfully completed a baccalaureate nursing program were older (median age twenty-eight years) than typical college students and scored significantly higher on the SAT verbal test than students who failed or withdrew. The two groups did not differ on the SAT mathematics score. The investigators explained that these findings are congruent with the age-related decline of mathematic concepts and the simultaneous enhancement of verbal reasoning. Berry (1980), in a study to identify critical variables of associate degree students who passed the licensure
examination on first writing, confirmed that successful students were significantly higher in verbal skills than unsuccessful students. In addition, the characteristic successful student was found to be female, thirty years of age, and married. Felts (1985) found that married students outperform their counterparts on the NCLEX. Seither (1974) found that older students have a greater probability for success in practical nursing as measured by academic achievement. The investigator stresses that there is a need to identify possible contributors to success, such as the mature student's life-style and previous experiences. Seither (1974, 1980) considers learning from experience as an intervening variable which must be considered in evaluating adult learning.

Yess (1980) compared nursing students with students in six other programs in one community college and found that the nursing students (1) were older, (2) had more dependents than other groups studied, and (3) had the highest SAT verbal scores of any group. Another study (Aldag and Rose 1983) reported that older persons comprise a larger proportion of students enrolled in associate degree programs than in other types of nursing programs. These investigators acknowledged the importance of understanding the relationship of age to entrance criteria and performance. Carse (1984) found a significant positive relationship
between age, college grade-point average, average nursing
theory grades, and SBTPE outcomes. Like Carse, Felts (1986)
found that age was not significantly correlated with NCLEX
scores.

Knowles' andragogical assumption, as well as the fore-
going study findings, provide support for the fourth
hypothesis in this study. As the new state board examination
evaluates problem-solving abilities, and as increasing
numbers of mature adults are taking the state board test, the
findings of this study may have a significant impact on state
board examination performance prediction.

Practical Nursing Educational Experience
and Licensure Examination Performance

As a result of changing societal health care and
professional needs, increasing numbers of Licensed Practical
Nurses (LPNs) are seeking advanced nursing education as a
means to enhance knowledge, skills, and career mobility.
Many LPNs are completing community college associate degree
nursing programs in order to prepare for the national
examination for registered nurse licensure. Several studies
have been conducted in response to educators' concerns
regarding the effect, if any, of prior practical nursing
educational experience on licensure examination performance.

Miller and Meier (1974) found that licensed practical
nurse experience was not significant as a predictor of
former state board test outcomes for associate degree nursing students. Bierchen (1981) compared academic and state board examination performances of associate degree nursing graduates with and without practical nursing education and found that the two groups were comparable in achievement and equally successful in attaining licensure as registered nurses.

Like Bierchen, Lambert (1982) found no significant differences in State Board Test Pool Examination scores between graduates with and without prior practical nursing education, although actual group mean scores differed slightly. Graduates without prior practical nursing education scored higher as a group than those with such education. In addition, graduates without prior practical nursing education had higher composite ACT scores than those with prior education. Felts (1986) also found no significant difference in licensure examination performance between unlicensed and licensed practical nurse students. Berry (1980) and Hultquist (1981) found prior practical nursing licensure and nursing work experience as significant predictors of academic success in associate degree nursing programs.

Other investigators (Froman and Owen 1984) identified a positive relationship between age and academic-NCLEX performance, stated that older students typically have had prior nursing-related experience (LPNs or nurse's aides),
and inferred that such experience may enhance entry cognitive skills which augment subsequent academic performance and achievement. Such an inference is congruent with Knowles' (1970) adult learning theory assumption that, in the process of maturing, the individual accumulates experiences which become a basis to which new learning is related. New learning takes on meaning when related to past experience, and understanding is organized around previous encounters with a subject. Conversely, prior learning may interfere with new learning if the previously-learned information is different in important aspects (as in a change from task-orientation to primary nursing care with decision-making responsibilities) or if old habits interfere with behavior change (Knox 1977).

Thus, prior practical nursing education could facilitate or inhibit new learning. Lambert (1982) stressed that further study is needed in the area of prior nursing-related work or educational experience and its impact on learning in nursing programs and licensure examination performance.

**Ethnic Considerations and Licensure Examination Performance**

Few studies have addressed differences in licensure examination outcomes or preadmission and academic correlates of success on nursing state board examinations in relation
to race or ethnicity. Recent studies (Dell and Halpin 1984; Outtz 1979) have acknowledged the paucity and identified two major needs in this area of research: (1) evidence of differences, if any, in state board examination performance outcomes between black nursing graduates and graduates in other racial groups; and (2) identification of predictors, if any, which are especially significant to black nursing students' academic achievement and licensure examination performance.

Gold (1981) conducted a postgraduate follow-up of 111 community college nursing graduates for the purpose of curriculum evaluation. The survey outcomes included responses from thirty-three white, seventeen black, twenty-seven hispanic, nineteen Asian-Pacific Islander, and fifteen multi-ethnic graduates. Study findings revealed that (1) 65 percent of the respondents worked while attending college, (2) 20 percent utilized college tutoring services, (3) many felt that more clinical experience should have been provided, and (4) the graduates felt they were least prepared for the psychiatric nursing components of the State Board Test Pool Examination. Although the respondents in this study were from predominantly minority groups, no inference can be drawn as to the uniqueness of the responses and felt needs to these groups. In addition, no academic or state board outcomes were reported for comparisons.
Six studies have produced results relating to prediction of black students' success on the former state board examination (SBTPE). Bain (1974), in a study of 1,024 graduates of ten Texas nursing schools, found that Anglo students made higher scores than black or Mexican students. Based on results obtained from data collected for 110 black baccalaureate program graduates from 1973 to 1977, Outtz (1979) reported that the cumulative college grade-point average was the best predictor in the SBTPE areas, and the SAT verbal examination was the second best predictor of SBTPE success. In addition, significant positive relationships were identified between high school and college grade-point averages and between high school and college science course grade-point averages. Outtz stated further investigations are necessary in order to provide a valid basis for student counseling and instruction.

In one study of thirty-four baccalaureate graduates' licensure examination performance (Rush and Belock 1986), it was reported that the major factor in the data of students who failed the examination was the ethnicity of the student. Students with foreign backgrounds (Asian, black or Hispanic) had the most failures in the nursing program and on the licensure examination, and had the lowest scores on the College Level Academic Skills Test, which assessed basic level abilities in reading comprehension, writing, conceptualizing, and analyzing.
Dell and Halpin (1984), in results of a study of 456 black students enrolled from 1970 to 1974 in a private baccalaureate nursing school, reported that high school grade-point average, SAT verbal and quantitative scores and NLN preadmission test scores significantly differentiated between nursing program dropouts and graduates. These same predictors, plus college grade-point average, were also significant predictors of state board examination success or failure for the 181 students who graduated. The investigators encouraged the use of NLN Prenursing Examinations and acknowledged that predictors for black nursing graduates seem to be no different from those for other ethnic groups.

Frierson (1986), in results of a study of 139 nursing graduates (129 black and 10 white graduates) reported that SAT verbal and mathematics scores and nursing grade-point average were significant predictors of state board examination performance. Frierson found that one experimental group who received test-taking instruction and participated in team learning achieved a higher mean state board examination score than two groups who did not receive both interventions. This investigator stated that minority students generally score below the national mean on standardized tests, such as the state board examination, and are generally less testwise than non-minority students. Frierson recommended additional investigation of cooperative
learning and test-taking instruction methods and encouraged use of these methods for enhancing performance of students who are expected to score below the national mean on standardized tests.

Yocom and Scherubel (1985) identified race as a significant predictor of SBTPE performance in a study of 139 baccalaureate graduates between August, 1979 and June, 1980. These investigators reported significant associations between school attended prior to nursing school admission, race, and state board performance. Minority students accounted for only 10 percent (n = 14) of the study population. The investigators advised caution in consideration of the import of these findings, and indicated that additional study is needed in this area.

In addition, investigations are needed to determine if race or ethnic background is related to performance on the new licensure examination (NCLEX). As increasing numbers of minority nursing graduates are taking the new examination, the findings of this study may have a significant impact on licensure examination performance predictions.

**Summary**

As nursing licensure examination outcomes represent a criterion measure of nursing program effectiveness and individual practice competency, successful state board examination performance is a mutual goal of nursing students
and educators. Based on past study results which determined variables positively related to former SBTPE performance, nurse educators have utilized former NLN test scores as performance predictor variables and as tools for student guidance and program revision. In addition, educators have acknowledged preadmission abilities, academic achievement, prior educational experience, ethnicity, and student age as SBTPE performance-influencing variables worthy of consideration.

Indicators of performance in relation to the former SBTPE are no longer valid. New research is needed to establish the validity of the new Mosby's Assess Test as a predictor of new state board examination (NCLEX) outcomes and to determine relationships among formerly established SBTPE performance-influencing variables and the new NCLEX.
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CHAPTER III

PROCEDURES FOR COLLECTION OF DATA

Introduction

This chapter describes the procedures used for the collection of the data, the research design, the sample, the instruments used as predictor and criterion variables, and the procedures for analysis of data.

Research Procedures

This ex post facto study was conducted in one Texas community college associate degree nursing program. Permission for the study and utilization of student and graduate data for 1982 through 1984 was obtained from the Dean of Health Occupations and from the Research and Evaluation Committee. A plan to ensure individual right to privacy, program anonymity, and confidentiality of data was approved by the Dean, the research committee, and appropriate administrative officials.

Data for use in this study were obtained from official records including student files, grade records, and standardized test outcome reports. Information included NCLEX, Mosby, and Nelson-Denny reading test scores, semester unit test results and numerical averages, age, ethnicity, and prior practical nursing education. All data
were numerically coded for processing according to a numerical NCLEX score, and were grouped according to coded campus location and coded date of licensure examination. No individual identifying data which can be traced were included.

Research Design

This study was designed to determine correlations among assess test scores, academic achievement and demographic variables, and outcomes on the National Council of State Boards of Nursing Licensure Examination (NCLEX). No experimental design was necessary as the criterion measure was the NCLEX score. Correlations were computed between the total raw score on the NCLEX and each of the numerically-coded academic and demographic predictor variables.

There was no attempt to assign causality, as there is no implied cause and effect relationship in correlational studies. Such studies are designed to either discover or clarify relationships among variables by using correlation coefficients. A number of variables and relationships and the degree of the relationships can be measured simultaneously (Borg and Gall 1979).

The Sample

As heterogeneous subgroups were utilized and a potential for uncontrolled variables existed (remedial
instruction and incomplete records), the entire population of 558 graduates was utilized in the study in order to ensure dependable results and to prevent a large standard error of sample statistics from obscuring small differences (Borg and Gall 1979; Kerlinger 1973).

Instruments

Two predictor variables and the criterion variable in this study were represented by scores obtained on standardized tests.

Predictor Variables

One predictor variable represented by a standardized test score was the new, comprehensive Mosby's Assess Test designed to provide broad coverage of, and to require depth and breadth of understanding across, nursing content in all categories of the nursing process. The multiple choice examination, designed to assess basic nursing knowledge, is administered at the completion of the program of nursing study. The Kuder-Richardson reliability coefficient for the examination is 0.952 (Michaels 1984). The test is authored, normed, and scored by The C. V. Mosby Company. Test outcomes are reported in raw scores (number correct) and percentage correct, which indicate individual student mastery of nursing, and percentile scores, which reflect the individual's performance in relation to performances of
a national norm group of registered nurse students (Saxton et al. 1984).

The Mosby's Assess Test consists of four, 120-question, content-integrated tests. Each test requires two hours for administration. The examination simulates and follows the blueprint for the NCLEX experience and allows for a sampling of questions in each measured ability. These abilities or categories include nursing behaviors (assessing, analyzing, planning, implementing, and evaluating); cognitive levels (knowledge, comprehension, application, and analysis); locus of decision making (nurse-centered, shared, and client-centered); and clinical areas (medical, surgical, obstetric, pediatric, and psychiatric (Bloom 1956; Saxton et al. 1984).

The test is constructed by editorial panel selection of test items, compilation of ten parallel tests, field testing of each item on nursing students, and item analysis with identification of psychometrically sound questions and levels of difficulty. Final selection of test items is made by the editorial board (Saxton et al. 1984).

Mosby's Assess Test is scored by assigning each question a single point value, and scores are obtained by totaling the numbers of correct answers. The examination is intended to enable learning; therefore, there is no penalty or correction for guessing and examinees are encouraged to
answer all questions. Both individual analyses and institutional profiles are made available to enable identification of possible teaching-learning process problems and to enhance individual examinee guidance and instruction (Saxton et al. 1984).

Strict test security is maintained. Only appropriate nursing program faculty and the Mosby editorial board have access to the actual test. The test is administered by specified nursing program faculty and test conditions are standardized. Retakes are not allowed, as test-retest contamination invalidates variances in scores. Scores are not to be utilized in grading by educational institutions and are not to be interpreted as dichotomous (pass-fail) outcomes. Individual raw scores and percentiles merely provide information regarding the individual's standing relative to the norm and number of raw score points relative to the reported maximum of 480 (Saxton et al. 1984).

The second predictor variable represented by a standardized test score was the Nelson Denny Reading Test, which is designed to measure vocabulary, comprehension, and rate. The new Form C is utilized for diagnostic, predictive, and screening purposes to provide users with a useful and accurate measure of undergraduate abilities which are vital to academic and professional success. According to the
test authors' Examiner's Manual, the combined total score of vocabulary and comprehension is the best single measure of reading ability (Brown, Nelson and Denny 1973).

Designed for use in grades nine through sixteen, the thirty-minute multiple choice test includes one-hundred vocabulary questions (ten minutes) and thirty-six comprehension items (twenty minutes). As with all standardized tests, scores are considered valid only if the time limit is strictly observed and standard test administration procedures are followed. Individual scores are based on the number of correct responses. With no penalty for guessing, it is to the individual's advantage to attempt to answer all questions. Double weight is assigned to the comprehension score in arriving at the total score. Raw scores (number of correct responses) and percentiles are reported in relation to the test form utilized and the grade level (Brown et al. 1973).

Evidence of test validity is presented in difficulty and discrimination indexes and in research outcomes by Brown et al. (1973) which demonstrate high correlation coefficients (median .47) in relation to scholastic ability and success, course grades, and scores on other tests. According to the authors, content validity is best determined by user examination of test content in relation to local objectives. Test reliability is evidenced in reliability coefficients ranging
from .54 to .98 in results of investigations of internal consistency and stability using equivalent forms and split-halves methods. Specific research results, test administration directions, and other technical information is presented by the authors in the 1984 Nelson Denny Reading Test Examiner's Manual.

In this investigation, Form C of the Nelson Denny Reading Comprehension Test (Brown et al. 1973) was utilized by the participating community college to measure current skills upon entry into the associate degree nursing program. A minimum score of fifteen points was required for program enrollment eligibility.

Criterion Variable

The criterion variable, represented by a standardized test score and reported and utilized for purposes of this study as a standard score, was the new, comprehensive National Council of State Boards of Nursing Licensure Examination (NCLEX) (McQuaid and Kane 1981) designed to provide broad coverage of nursing content in all categories of the nursing process. NCLEX test plan and format are presented in Appendix A. The objective test covers nursing behaviors in five categories representing the nursing process: assessing, analyzing, planning, implementing, and evaluating. Knowledge levels of analysis and application are emphasized and examinees are required to utilize
problem-solving abilities (the nursing process) to select the "best" (appropriate) nursing behavior from four presented options in relation to nursing care situations presented. Each item represents one of three control loci: nurse, patient, or nurse and patient in collaboration to make patient care decisions based on analysis and application of the nursing process. Item type samples (Cloud-Hardaway 1982), with breakdown of locus of control, knowledge level, and nursing process category examined are presented in Appendix B.

Like the Mosby's Assess Test, (1) the objective NCLEX may be considered a type of projective test (although not open-ended), as presented situations require the graduate nurse to select an option which represents appropriate behavior to be implemented in a specific instance, and (2) the NCLEX is limited in that knowledge levels of analysis and application of appropriate nursing care behaviors, not actual affective or psychomotor clinical skills, are examined (Jacobs, Fivars and Fitzpatrick 1982).

Standard scores obtained reflect the individual graduate's level of competency or safety upon entry into registered nurse practice, and a total passing standard score of 1600 represents the minimum safety level for practice entry. Test items are derived from "critical incidents" which have been identified as a foundation for
test validity and which are behaviors that constitute safe and effective nursing practice (Jacobs et al. 1978). Total standard scores are reported for applicants who pass the examination; whereas, nursing graduates who fail the test receive a breakdown of scores on nursing process categories as well as the total standard score. Therefore, one total standard score was utilized for purposes of data collection in this study. In designating a 1600 passing score, boards are requiring candidates to select "best" answers to approximately one-half of the total items. Means and standard deviations are computed for total scores. As the new NCLEX scoring includes no correction formula for guessing, scores are reported on the basis of total number of items answered correctly.

The two-day, four-section examination is administered in each state in February and July of each year. Test conditions are standardized, and instructions are read by state board representatives to all examinees at the beginning of each test day. Approximately ten examinees are adequately spaced at each of several long tables, and each table is monitored by an end-of-table proctor. Machine-scored test booklets are provided each applicant and applicants mark answers directly in the booklet. By not utilizing additional and separate score sheets, test security is enhanced. Numbered test booklets are collected
and counted at each table after each section of the examination, and no applicant is allowed to leave the examination room during testing unless accompanied by a state board representative. In addition, no applicant is allowed to enter the room after test instructions have begun, all applicants are subject to a search of personal belongings upon entering and leaving the room, and applicant behaviors during testing are carefully monitored and may be questioned. Any questionable behaviors warrant dismissal from the remainder of the examination, destruction of portion of test completed, and if appropriate, reapplication for the licensure examination. Test items are seen only by National Council of State Boards of Nursing (NCSBN) appointed expert writers, experts determining content validity, and producers and scorers (Staff 1981, 1982).

Testing for reliability and national norming are accomplished over a period of two years. A fifth, and additional, test is given to each applicant at the end of the second day of testing. This test contains items to be determined reliable and to be normed, and the scores obtained from this test are neither included in the applicant's standard score nor included in the score report. Items judged to be too easy or too difficult are discarded, and items demonstrating consistent outcomes are retained for future inclusion in NCLEX sections (Council of State
Boards of Nursing 1976, 1979). All five nursing process
categories are equally weighted and criterion-referenced.
An expert panel, composed of nurse educators and practic-
ing experts selected by the NCSBN, judges the number of
items in each category which should be answered correctly
by a majority of graduates. The examination is administered
in four sections. Applicants who do not obtain a minimum
of 1600 total standard points for the four sections are not
licensed to practice. Scores are reported to both
individuals and programs. Most states allow applicants to
retake the examination at the next semiannual session;
however, most states require a formal course of study after
a maximum of two to three retakes. Applicants not obtain-
ing the minimum passing score are required to take the
entire four-section examination again (Kopala, Ritzman and
Young 1982).

Procedure for Analysis of Data

The numerically coded data were organized, tabulated,
and inspected. Correlation coefficients were computed
between predictor variables (semester numerical averages,
number of unit tests failed, age, ethnicity, prior LPN
education, and scores of the Mosby's Assess Test and
Nelson Denny Reading Tests) and the criterion variable,
scores of the NCLEX. Data were prepared for automatic data
processing using the Statistical Analysis System (SAS).
Hypotheses 1, 2, and 3 were tested in the null by computing Pearson Product Moment correlational coefficients for Mosby's Assess Test raw scores, Nelson Denny Reading Test entrance examination raw scores, semester numerical averages, number of unit tests failed, and NCLEX standard scores. A correlation matrix was produced. Multiple regression analysis was performed to determine the combination of predictors which yielded the best estimate of the criterion variable.

Hypothesis 4, 5, and 6, which addressed age, ethnicity, and prior LPN education as these related to NCLEX outcomes, were tested in the null. T-tests for statistical significance of differences between group means or combinations of group means were performed.

The acceptable level of significance was .05. Data are reported in relation to the hypotheses and obtained correlation coefficients.

Summary

In this chapter, the procedures for the collection of data were presented. It was explained that Mosby's Assess Test scores, academic achievement measures, and demographic variables for 558 associate degree nursing graduates were correlated with scores of the National Council of State Boards of Nursing Licensure Examination (NCLEX) in order to identify significant relationships among variables and
differences in performance among graduates. Mosby's Assess Test and the Nelson Denny Reading Test were presented as standardized instruments for collection of data (scores) which represented two predictor variables in the study. The NCLEX was presented as a standardized instrument for collection of data (scores) which represented the criterion variable. Each of the instruments were examined in relation to validity, reliability, limitations, standardization, national norming, test content and construction, test plan and format, scoring, and testing procedures.

The procedures for analysis of the data specified all variables in relation to raw scores, standard scores, semester numerical averages, and numerical unit test counts, and explained age, ethnicity, and prior LPN education as demographic predictor variables.

Treatment of the study hypotheses was described with simple correlation coefficients, multiple regression analysis, and t-tests for significance of differences between means presented as data analysis strategies.
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CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Introduction

In this chapter the statistical study results are presented. The chapter is divided into sections addressing the six research hypotheses, which were rewritten and tested in the null as follows.

Hypothesis I: There is no significant positive relationship between achievement as measured by total mean scores of the new Mosby's Assess Test and practice performance competency as measured by total mean scores of the new National Council of State Boards of Nursing Licensure Examination (NCLEX).

Hypothesis II: There is no significant positive relationship between nursing graduates' total mean semester numerical averages and Nelson Denny reading entrance examination scores and total mean scores of the NCLEX.

Hypothesis III: There is no significant negative relationship between total mean number of semester-unit tests failed and total mean scores of the NCLEX.

Hypothesis IV: There is no significant difference in performance as measured by total mean NCLEX scores of graduates (a) age thirty-two and under and (b) age thirty-three and over.
Hypothesis V: There is no significant difference in performance as measured by total mean NCLEX scores of nursing graduates who (a) are Licensed Practical Nurses and (b) are not Licensed Practical Nurses.

Hypothesis VI: There is no significant difference in performance as measured by total mean NCLEX scores of (a) black nursing graduates and (b) white nursing graduates.

The first section presents a frequency distribution describing nursing graduates' educational and demographic characteristics and NCLEX profile. The second section covers Hypotheses I, II, and III. Hypotheses IV, V, and VI are presented in the final section of this chapter.

**Associate Degree Nursing Graduates' Educational, Demographic, and NCLEX Profile**

Data were collected for 558 associate degree nursing graduates who wrote the NCLEX in 1983 and 1984. Because data records were incomplete for some graduates on semester averages, total semester tests failed, Mosby's scores, Nelson Denny scores, and practical nurse licensure, the entire population was utilized in the study. Data were complete for all 558 graduates on NCLEX scores, ethnicity, and age.

A summary of the data revealed pertinent information regarding educational, demographic, and NCLEX characteristics of the graduates. Table 1 presents descriptive
statistics for all graduates in relation to ethnicity, age, LPN licensure, and NCLEX failures.

Table 1 shows that, of the 558 cases investigated, 19 percent were LPNs (N = 106), 68 percent were non-LPNs (N = 382), and 70 cases were unknown as to practical nurse licensure (12 percent). The age of only one case was unknown, 58 percent were ≤ age 32 (N = 326), and 41 percent were ≥ age 33 (N = 231). There were 88 black cases (16 percent), 441 white cases (79 percent), and 29 other—hispanic and Asian—cases (5 percent).

Table 1 also shows that, of the 76 graduates who failed the NCLEX (14 percent), 7 were LPNs (9 percent), 59 were non-LPNs (78 percent), and 10 cases (13 percent) had no data relating to LPN licensure. Sixty-seven percent (N = 51) of cases failing the NCLEX were graduates ≤ age 32. Thirty-three percent (N = 25) of cases failing the NCLEX were ≥ age 33. Of the 76 graduates who failed the NCLEX, 34 (45 percent) were black, 35 (46 percent) were white, and 7 (9 percent) were hispanic or Asian.

Also presented in Table 1 are numbers and percentages of NCLEX failures among educational, age, and ethnic groups. In the black ethnic group, 3 LPNs (4 percent), 23 non-LPNs (30 percent), and 8 unknown as to LPN status (11 percent) failed the NCLEX. Of the white ethnic group, 4 LPNs (5 percent), 29 non-LPNs (38 percent), and 2 unknown as to LPN
<table>
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**Education**

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**Ethnicity**

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*ADN = Associate Degree Nursing.  **<1600.  ***Hispanic and Asian.
status (3 percent) failed the NCLEX. In the other (hispanic and Asian) ethnic group, 7 (9 percent) non-LPNs failed the NCLEX. In the \( \leq 32 \) age group, 2 (3 percent) were LPNs, 44 (58 percent) were non-LPNs, and 5 (7 percent) were unknown as to LPN status. Of the cases \( \geq 33 \), 5 (7 percent) were LPNs, 15 (20 percent) were non-LPNs, and 5 (7 percent) were unknown as to LPN status. Among the cases \( \leq 32 \) years of age, 22 (29 percent) were black, 24 (32 percent) were white, and 5 (7 percent) were hispanic or Asian. In the \( \geq 33 \) age group, 12 blacks (16 percent), 11 whites (14 percent), and 2 hispanic or Asian cases (3 percent) failed the NCLEX.

Of the LPN graduates who failed the NCLEX, 1 (1 percent) was \( \leq 32 \), 6 (8 percent) were \( \geq 33 \), and 5 (7 percent) were unknown as to LPN status. Forty-four non-LPNs (58 percent) \( \leq 32 \), 15 non-LPNs (20 percent) \( \geq 33 \), and 5 (7 percent) unknown as to LPN status, failed the NCLEX. A higher NCLEX failure rate occurred among non-LPNs of all ethnic groups, non-LPNs \( \leq 32 \) (younger graduates), and in younger (\( \leq 32 \)) black and white groups.

Statistical results for Hypotheses I, II, and III are presented in the next section of this chapter.

**Hypotheses I, II, and III**

Coefficients of correlation, determined by the Pearson product moment technique, for study Hypotheses I, II, and III are presented in Tables 2, 3, and 4.
Table 2 shows significant positive correlations among mean NCLEX scores, mean Nelson Denny raw scores, and five semester grade means. Significant negative correlations are demonstrated in Table 3 among mean number of unit tests failed in five semesters, mean Mosby's Assess Test raw scores, and mean NCLEX standard scores. Table 4 shows significant positive relationships among mean NCLEX, Mosby, and Nelson Denny scores and total mean semester average, and significant negative relationships among total semester tests failed and total average, and Mosby, Nelson Denny, and NCLEX mean scores. All coefficients are statistically significant ($p < .05$); therefore, the first three null hypotheses were rejected.

Table 2 presents relationships among NCLEX scores, Nelson Denny scores, and five semester averages for all nursing graduates.

A significant positive relationship is shown in Table 2 between mean Nelson Denny test scores and mean NCLEX scores ($r = .41, p = .0001$), and among five mean semester grade averages and NCLEX results. In addition, significant positive correlations are shown between semester grade means in each of five semesters and Nelson Denny mean scores, and between grade averages in one semester and each subsequent semester average.

A scatter plot of mean Nelson Denny and NCLEX scores is shown in Appendix C. A scatter plot of the mean semester
### TABLE 2

PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS AMONG SEMESTER AVERAGES, NELSON DENNY SCORES, AND NCLEX SCORES

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<th></th>
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<th>AVRN142</th>
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<th>AVRN250</th>
<th>AVRN255</th>
<th>NURND</th>
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AVRN: Mean semester grade average.  NURND: Mean Nelson Denny raw score.  NCLEX: Mean licensure examination standard score.
average and NCLEX scores is presented in Appendix D. Both plots depict linear relationships between the predictor variables and the criterion variable.

Correlations among Mosby's Assess Test scores, semester tests failed, and NCLEX scores are presented in Table 3. Table 3 also shows a significant positive relationship \( r = .72, p = .0001 \) between Mosby's scores and NCLEX scores. Significant negative relationships are presented between mean number of unit tests failed in each of five semesters and NCLEX results. In addition, significant positive relationships are shown in Table 3 between mean number of unit tests failed in one semester and mean number of tests failed in subsequent semesters. Significant negative relationships are demonstrated between mean number of unit tests failed in each of five semesters and Mosby test results. A scatter plot and a diagram showing the corresponding linear regression line for mean Mosby's Assess Test and NCLEX scores are presented in Appendix E. A scatter plot for mean number of semester-unit tests failed and NCLEX scores is presented in Appendix F. This plot depicts a linear negative relationship, and shows that the greater the number of semester tests failed, the lower the mean NCLEX score.

Relationships among total mean semester average, total mean number of unit-semester tests failed, and mean
### Table 3

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</table>

NCLEX: Mean licensure examination standard score. UTS: Mean number of semester-unit tests failed. MOSBY: Mean Mosby's Assess Test raw score.
scores of the NCLEX, Mosby, and Nelson Denny are presented in Table 4.

Table 4 shows a significant positive relationship between the mean NCLEX score and the mean Mosby score \((r = .72, p = .0001)\), between the mean NCLEX score and the mean Nelson Denny score \((r = .41, p = .0001)\), and between the mean NCLEX score and the total mean semester average \((r = .78, p = .0001)\). A significant negative relationship is shown between the mean NCLEX score and the total mean number of semester-unit tests failed \((r = -.66, p = .0001)\). In addition, significant negative relationships are shown between total mean number of semester-unit tests failed and (1) total semester average, (2) the mean Mosby score, (3) the mean Nelson Denny score, and (4) the mean NCLEX score.

Statistical results for Hypotheses IV, V, and VI, and regression analyses for all predictor variables are explained in the final section of this chapter.

**Hypotheses IV, V, and VI**

Differences in NCLEX performance in relation to nursing graduates' demographic variables, determined by \(t\)-tests for significant differences between means, are presented in Tables 5, 6, and 7. The matrices show significant differences in NCLEX scores between (1) younger graduates (age 32 and under) and older graduates (age 33
### TABLE 4

**Pearson Product-Moment Correlation Coefficients Among Total Mean Semester Tests Failed, Total Mean Semester Average, and NCLEX, Mosby, and Nelson Denny Mean Scores**

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<th>MOSBY</th>
<th>NURND</th>
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<td>261</td>
<td>308</td>
<td>288</td>
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</table>

- **NCLEX**: Mean licensure examination standard score.
- **TOTAVR**: Total mean semester average.
- **TOTFAIL**: Total mean number of semester-unit tests failed.
- **MOSBY**: Mean Mosby's Assess Test raw score.
- **NURND**: Mean Nelson Denny Reading Test raw score.
and over), (2) graduates with prior practical nursing education (LPNs) and those without nursing education (non-LPNs), and (3) black and white nursing graduates. Differences for all hypotheses are statistically significant ($p < .05$); therefore, null Hypotheses IV, V, and VI were rejected.

Differences among predictor variables in relation to age, ethnicity, and prior practical nurse licensure are presented in Tables 8, 9, and 10. Tables 11 through 16 show multiple regression analyses of predictor variables which yielded the best estimate of the criterion variable for all graduates and for graduates in relation to ethnicity, age, and nursing educational status (LPN and non-LPN). The final part of this section, Tables 17 through 20, present relationships among all predictor variables for black and white graduates and results of t-tests for differences in standardized test and academic performance between black and other minority graduates and between white and all minority graduates.

Table 5 presents age-related differences in standard NCLEX mean scores. A significant difference ($p < .05$) is shown in Table 5 between older and younger nursing graduates' mean NCLEX scores. The mean NCLEX score of older graduates was significantly greater ($p = .0001$) than the mean score for younger graduates. A scatter plot showing age-related differences in mean NCLEX scores is presented in Appendix G.
TABLE 5

RESULTS OF t-TEST PROCEDURE FOR DIFFERENCES IN NCLEX MEAN SCORES BETWEEN OLDER AND YOUNGER GRADUATES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Younger (Less than 32)</th>
<th>Older (More than 33)</th>
<th>t</th>
<th>p</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 326</td>
<td>N = 231</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>SD</td>
<td>DF</td>
<td>X</td>
<td>SD</td>
</tr>
<tr>
<td>NCLEX</td>
<td>1897.20</td>
<td>296.82</td>
<td>325</td>
<td>2004.90</td>
<td>345.56</td>
</tr>
</tbody>
</table>

NCLEX: Mean licensure examination score.
Table 6 presents differences in mean standard NCLEX scores between nursing graduates with prior practical nursing education (LPNs) and graduates with no prior nursing education (non-LPNs). A significant difference (p < .05) is shown in Table 6 between LPN and non-LPN nursing graduates' mean NCLEX scores. The mean NCLEX score for graduates with prior practical nursing education was significantly greater (p = .0003) than the mean NCLEX score for graduates with no prior nursing education. A scatter plot showing differences in LPN status and mean NCLEX scores is presented in Appendix H.

Table 7 presents differences in mean NCLEX scores between black nursing graduates and white nursing graduates. A significant difference (p < .05) is shown in Table 7 between white and black nursing graduates' mean NCLEX scores. The mean NCLEX score for white graduates was significantly greater (p = .0001) than the mean score for black graduates. A scatter plot showing differences in ethnicity and mean NCLEX scores is presented in Appendix I. Diagrams showing (1) NCLEX mean scores by sitting and ethnicity and (2) NCLEX mean score trends by sitting and ethnicity are presented in Appendix J.

Table 8 presents age-related differences in the mean Mosby's score, the mean semester average, the mean number of semester-unit tests failed, and the mean Nelson Denny score.
### TABLE 6

**RESULTS OF t-TEST PROCEDURE FOR DIFFERENCES IN MEAN NCLEX SCORES BETWEEN LPN AND NON-LPN GRADUATES**

<table>
<thead>
<tr>
<th>Variable</th>
<th>LPN (N = 106)</th>
<th>Non-LPN (N = 382)</th>
<th>t</th>
<th>p</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCLEX</td>
<td>2047.31 277.47 105</td>
<td>1929.41 325.15 381</td>
<td>3.7</td>
<td>.0003</td>
<td>1.37</td>
</tr>
</tbody>
</table>

**NCLEX:** Mean licensure examination score.

### TABLE 7

**RESULTS OF t-TEST PROCEDURE FOR DIFFERENCES IN MEAN NCLEX SCORES BETWEEN BLACK AND WHITE GRADUATES**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Black Graduates (N = 88)</th>
<th>White Graduates (N = 441)</th>
<th>t</th>
<th>p</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCLEX</td>
<td>1671.63 272.23 87</td>
<td>2007.32 300.53 440</td>
<td>9.7</td>
<td>.0001</td>
<td>1.22</td>
</tr>
</tbody>
</table>

**NCLEX:** Mean licensure examination score.
Table 8 shows the following statistically significant (p < .05) differences: (1) older graduates had a higher (p = .0033) mean Mosby's Assess Test score and a greater mean semester average (p = .0035) than did the younger graduates; (2) the mean number of semester tests failed was higher (p = .0047) for the younger graduates than for the older group; and (3) the younger graduates' mean Nelson Denny score was higher (p = .0007) than the mean score for older graduates.

Table 9 presents differences in the mean Mosby's score, the mean semester average, the mean number of semester-unit tests failed, and the mean Nelson Denny score between graduates with prior practical nursing education (LPNs) and those without prior nursing education (non-LPNs).

Table 9 shows the following statistically significant differences (p < .05): (1) LPN graduates' mean Mosby score was higher (p = .0005) than the mean score for non-LPN graduates, and (2) non-LPN graduates' mean Nelson Denny score was slightly higher (p = .0267) than the score for LPN graduates. No significant differences are shown between the two groups' total mean semester average (p = .9893) and total mean number of semester tests failed (p = .1010).

Table 10 presents differences in the mean Mosby's score, the mean semester average, the mean number of
TABLE 8

RESULTS OF t-TEST PROCEDURES FOR DIFFERENCES IN MOSBY'S SCORES, SEMESTER AVERAGES, NUMBER OF SEMESTER TESTS FAILED, AND NELSON DENNY SCORES BETWEEN OLDER AND YOUNGER GRADUATES

<table>
<thead>
<tr>
<th>Variable Compared</th>
<th>Younger (≤ 32)</th>
<th>Older (&gt; 33)</th>
<th>t</th>
<th>p</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSBY</td>
<td>272.11</td>
<td>283.19</td>
<td>173</td>
<td>174</td>
<td>134</td>
</tr>
<tr>
<td>TOTAVR</td>
<td>84.08</td>
<td>85.16</td>
<td>285</td>
<td>286</td>
<td>215</td>
</tr>
<tr>
<td>TOTFAIL</td>
<td>3.08</td>
<td>2.36</td>
<td>250</td>
<td>251</td>
<td>195</td>
</tr>
</tbody>
</table>

MOSBY: Mosby's Assess Test mean score.
TOTAVR: Mean semester average.
TOTFAIL: Mean number of semester tests failed.
NURND: Mean Nelson Denny score.
TABLE 9
RESULTS OF t-TEST PROCEDURES FOR DIFFERENCES IN MOSBY'S SCORES,
SEMESTER AVERAGES, NUMBER OF SEMESTER TESTS FAILED, AND
NELSON DENNY SCORES BETWEEN LPN AND NON-LPN GRADUATES

<table>
<thead>
<tr>
<th>Variable Compared</th>
<th>LPN Graduates</th>
<th>Non-LPN Graduates</th>
<th>t</th>
<th>p</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>SD</td>
<td>DF</td>
<td>N</td>
<td>X</td>
</tr>
<tr>
<td>MOSBY</td>
<td>289.96</td>
<td>31.24</td>
<td>59</td>
<td>60</td>
<td>273.56</td>
</tr>
<tr>
<td>TOTAVR</td>
<td>84.73</td>
<td>4.10</td>
<td>93</td>
<td>94</td>
<td>84.74</td>
</tr>
<tr>
<td>TOTFAIL</td>
<td>2.25</td>
<td>2.42</td>
<td>83</td>
<td>84</td>
<td>2.78</td>
</tr>
<tr>
<td>NURND</td>
<td>19.50</td>
<td>5.48</td>
<td>98</td>
<td>99</td>
<td>20.75</td>
</tr>
</tbody>
</table>

MOSBY: Mosby's Assess Test mean score.
TOTAVR: Mean semester average.
TOTFAIL: Mean number of semester tests failed.
NURND: Mean Nelson Denny score.
<table>
<thead>
<tr>
<th>Variable Compared</th>
<th>Black Graduates</th>
<th>White Graduates</th>
<th>t</th>
<th>p</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSBY</td>
<td>253.87</td>
<td>282.20</td>
<td>6.68</td>
<td>.0001</td>
<td>2.00</td>
</tr>
<tr>
<td>TOTAVR</td>
<td>81.27</td>
<td>85.28</td>
<td>10.38</td>
<td>.0001</td>
<td>2.07</td>
</tr>
<tr>
<td>TOTFAIL</td>
<td>4.65</td>
<td>2.37</td>
<td>-5.64</td>
<td>.0001</td>
<td>1.47</td>
</tr>
<tr>
<td>NURND</td>
<td>16.45</td>
<td>21.26</td>
<td>7.97</td>
<td>.0001</td>
<td>1.14</td>
</tr>
</tbody>
</table>

MOSBY: Mosby's Assess Test mean score.
TOTAVR: Mean semester average.
TOTFAIL: Mean number of semester tests failed.
NURND: Mean Nelson Denny score.
semester-unit tests failed, and the mean Nelson Denny score between black and white students.

Table 10 shows significant differences (p < .05) between white and black graduates' mean scores on all predictor variables (p = .0001). White graduates had higher mean Mosby and Nelson Denny scores and total semester average. Black graduates' mean number of semester tests failed was higher than the mean for white graduates.

Table 11 presents multiple regression analysis of predictor variables as these yielded the best estimate of the criterion variable (NCLEX) for all graduates.

**TABLE 11**

**STEPWISE REGRESSION FOR ALL PREDICTOR VARIABLES IN RELATION TO ALL GRADUATES' NCLEX SCORES**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta</th>
<th>t</th>
<th>p</th>
<th>R²</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSBY</td>
<td>.2976</td>
<td>6.426</td>
<td>.0001</td>
<td>.84</td>
<td>.70</td>
</tr>
<tr>
<td>TOTAVR</td>
<td>.5597</td>
<td>11.754</td>
<td>.0001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGE (³33)</td>
<td>.0881</td>
<td>2.536</td>
<td>.0118</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NURND</td>
<td>.0785</td>
<td>2.100</td>
<td>.0367</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 254. a: p = .0001; F = 151.6; DF = 4, 250.

Table 11 shows that mean Mosby and Nelson Denny (NURND) scores, mean semester average (TOTAVG) and age above 33 explain 70 percent of the variance in the mean
NCLEX score for all graduates ($p = .0001$). All variables are statistically significant ($p < .05$). The relative importance of each variable is shown in standardized beta weights as follows: (1) total semester average (.5597); (2) Mosby mean score (.2976); (3) age 33 or above (.0881); and (4) Nelson Denny mean score (.0785). No other variables met the .15 significance level for entry into the model.

Table 12 presents multiple regression analysis of predictor variables as these yielded the best estimate of the criterion variable (NCLEX) for older (above 33) and younger (below 32) graduates.

Table 12 shows that mean Mosby score and total semester average (TOTAVR) explain 75 percent of the variance in NCLEX scores for older graduates ($p = .0001$). Each variable is statistically significant ($p < .05$). The relative importance of each, respectively, is shown in the following standardized beta weights: total semester average (.5170); Mosby mean score (.4056). No other variables met the .15 significance level for entry into the model.

Mean Mosby score, total semester average (TOTAVR), Nelson Denny mean score (NURND), and LPN licensure explain 64 percent of the variance in NCLEX scores for younger graduates ($p = .0001$). Of the four variables, only the Mosby mean score, total semester average, and Nelson Denny mean score are statistically significant ($p < .05$). LPN licensure is not statistically significant ($p = .0928$).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Older Graduates (≥33) (N = 113)</th>
<th>Younger Graduates (&lt;32) (N = 140)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSBY</td>
<td>0.4056</td>
<td>0.7546</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td>0.443</td>
</tr>
<tr>
<td></td>
<td>0.0004</td>
<td>0.638</td>
</tr>
<tr>
<td></td>
<td>0.050</td>
<td></td>
</tr>
<tr>
<td>TOTAVR</td>
<td>0.5170</td>
<td>0.7022</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>NURND</td>
<td>0.001</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>0.093</td>
<td>0.093</td>
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<tr>
<td></td>
<td>0.093</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.093</td>
<td></td>
</tr>
<tr>
<td>LPN—Yes</td>
<td>0.0001</td>
<td>0.6157</td>
</tr>
<tr>
<td></td>
<td>0.0001</td>
<td>0.6157</td>
</tr>
<tr>
<td></td>
<td>0.0001</td>
<td>0.6157</td>
</tr>
<tr>
<td></td>
<td>0.0001</td>
<td>0.6157</td>
</tr>
</tbody>
</table>

**Notes:**
- MOSBY: Mean Mosby Assessment Test raw score.
- TOTAVR: Total mean semester average.
- NURND: Mean Nelson Denny Reading Test raw score.
- LPN: Licensed Vocational Nurse.
Standardized beta weights show the relative importance, respectively, of each variable to younger graduates' NCLEX mean score as follows: total semester average (.5638); Mosby mean score (.2314); Nelson Denny mean score (.1177); and LPN licensure (-.0903). The Nelson Denny mean score and LPN licensure carry relatively little weight in the regression. No other variables met the .15 significance level for entry into the model. The most important predictor variables for both the older and younger graduates' mean NCLEX score are total semester average and mean Mosby score.

Table 13 presents multiple regression analysis of predictor variables as these yielded the best estimate of the criterion variable (NCLEX) for LPN and non-LPN graduates.

Table 13 shows that mean Mosby score, total semester average (TOTAVR), and mean Nelson Denny (NURND) score explain 72 percent of the variance in NCLEX scores for LPN graduates (p = .0001). Mean Mosby score and total semester average variables are statistically significant (p < .05). The mean Nelson Denny score is not statistically significant (p < .05). Standardized beta weights show the relative importance, respectively, of each variable to LPN graduates' mean NCLEX score as follows: total semester average (.4960); Mosby mean score (.3309); and Nelson Denny mean score
<table>
<thead>
<tr>
<th>Variable</th>
<th>LPN Graduates (N = 46)</th>
<th>Non-LPN Graduates (N = 207)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta</td>
<td>t</td>
</tr>
<tr>
<td>MOSBY</td>
<td>.3309</td>
<td>2.862</td>
</tr>
<tr>
<td>TOTAVR</td>
<td>.4960</td>
<td>4.197</td>
</tr>
<tr>
<td>NURND</td>
<td>.1585</td>
<td>1.785</td>
</tr>
<tr>
<td>AGE (&gt;33)</td>
<td>.</td>
<td>.</td>
</tr>
</tbody>
</table>

a: p = .0001; F = 40.53; DF = 3, 43. b: p = .0001; F = 115.92; DF = 4, 203.

MOSBY: Mean Mosby's Assess Test raw score.
TOTAVR: Total mean semester average.
NURND: Mean Nelson Denny Reading Test raw score.
Mean Mosby score, total semester average, Nelson Denny mean score, and age above 33 explain 69 percent of the variance in the mean NCLEX score for non-LPN graduates (p = .0001). Mean Mosby score and total semester average are statistically significant (p < .05). The Nelson Denny mean score (p = .0477) meets the accepted .05 level of significance, and age above 33 is not statistically significant (p < .05). Standardized beta weights show the relative importance, respectively, of each variable to non-LPN graduates' mean NCLEX score as follows: total semester average (.5693); Mosby mean score (.2741); Nelson Denny mean score (.0853); and age above 33 (.0676). The mean Nelson Denny score and age above 33 carry relatively little weight in the regression. No other variables met the .15 significance level for entry into the model. The most important predictor variables for both LPN and non-LPN graduates' mean NCLEX score are total semester average and mean Mosby score.

Table 14 presents multiple regression analysis of predictor variables as these yielded the best estimate of the criterion variable (NCLEX) for black and white graduates.

Table 14 shows that LPN licensure is the only statistically significant (p < .05) predictor variable among all
TABLE 14

STEPWISE REGRESSION FOR ALL PREDICTOR VARIABLES IN RELATION TO BLACK AND WHITE GRADUATES' NCLEX SCORES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Black Graduates (N = 28)</th>
<th>White Graduates (N = 212)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta</td>
<td>t</td>
</tr>
<tr>
<td>MOSBY</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>TOTAVR</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>TOTFAIL</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>AGE (&gt;33)</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>NURND</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>LPN--Yes</td>
<td>-.4808</td>
<td>-2.850</td>
</tr>
</tbody>
</table>

a: \( p = .0083; F = 8.121; DF = 1, 27 \)

b: \( p = .0001; F = 121.20; DF = 4, 208 \)

MOSBY: Mean Mosby's Assess Test raw score.

TOTAVR: Total mean semester average.

TOTFAIL: Total mean number of semester-unit tests failed.

NURND: Mean Nelson Denny Reading Test raw score.

LPN: Licensed Vocational Nurse.
predictor variables, and explains 20 percent of the variance in the NCLEX mean score for black graduates \( p = .0083 \). No other variables met the .15 significance level for entry into the model.

Mean Mosby score, total semester average (TOTAVR), total mean number of semester-unit tests failed (TOTFAIL), and age above 33 explain 69 percent of the variance in the mean NCLEX score for white graduates \( p = .0001 \). Mean Mosby score, total semester average, and age above 33 are statistically significant \( p < .05 \), and total mean number of unit tests failed \( p = .0541 \) meets the .05 accepted level of significance. Standardized beta weights show the relative importance, respectively, of each variable to white graduates' mean NCLEX score as follows: total semester average \( (.4738) \); Mosby mean score \( (.3164) \); total semester-unit test failures \( (-.1279) \); and age above 33 \( (.0934) \). Age above 33 carries relatively little weight in the regression. No other variables met the .15 significance level for entry into the model.

A question was raised as to why only one predictor variable (LPN licensure) was found to be important in relation to black graduates' NCLEX performance, since mean standardized test scores and total average for blacks were significantly lower than mean scores and the total average for whites, and since blacks failed a significantly
greater number of semester tests than whites (Table 10). In addition, total semester average and mean Mosby's Assess Test scores were found to be the most important predictor variables in relation to all graduates' NCLEX success (Table 11); however, these variables did not enter the regression model for blacks. It was hypothesized that predictor variables may not enter the model if the variables share a great percentage of the variance in the NCLEX mean score for black graduates. Additional regressions were performed, which resulted in the findings presented in Tables 15 and 16. Related conclusions are presented in Chapter V.

Table 15 presents multiple regression analysis of all predictor variables, excluding LPN licensure, as these yielded the best estimate of the criterion variable (NCLEX) for black graduates.

TABLE 15

STEPWIDE REGRESSION FOR ALL PREDICTOR VARIABLES, EXCLUDING LPN LICENSURE, IN RELATION TO BLACK GRADUATES' NCLEX SCORES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta</th>
<th>t</th>
<th>p</th>
<th>$R^2$</th>
<th>Adj. $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOSBY</td>
<td>.4204</td>
<td>2.408</td>
<td>.0231</td>
<td>.1768</td>
<td>.1463</td>
</tr>
</tbody>
</table>

$a: p = .02; F = 5.799; DF = 1,27.$
Table 15 shows that the mean Mosby score is the only statistically significant (p < .05) variable among all predictor variables (excluding LPN licensure), and explains 15 percent of the variance in the NCLEX mean score for all black graduates (p = .0231). No other variable met the .15 significance level for entry into the model.

Table 16 presents multiple regression analysis of all predictor variables, excluding Mosby's Assess Test, as these yielded the best estimate of the criterion variable (NCLEX) for black graduates.

### TABLE 16

**STEPWISE REGRESSION FOR ALL PREDICTOR VARIABLES, EXCLUDING MOSBY'S ASSESS TEST, IN RELATION TO BLACK GRADUATES' NCLEX SCORES**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta</th>
<th>t</th>
<th>p</th>
<th>$R^2$</th>
<th>Adj.$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAVR</td>
<td>.5556</td>
<td>5.037</td>
<td>.0001</td>
<td>.4688</td>
<td>.4452</td>
</tr>
<tr>
<td>LPN--Yes</td>
<td>-.3152</td>
<td>-2.858</td>
<td>.0064</td>
<td>. .</td>
<td>. .</td>
</tr>
</tbody>
</table>

*a: p = .0001; F = 19.85; DF = 2, 45.*

Table 16 shows that, excluding Mosby's Assess Test, total mean semester average and LPN licensure are the only statistically significant (p < .05) variables among all predictor variables in relation to predicting black
graduates' NCLEX scores. Total semester average and LPN licensure together explain 45 percent of the variance in the NCLEX mean score for black graduates. No other variables met the .15 significance level for entry into the model.

Table 17 presents relationships among all predictor variables and NCLEX scores for black graduates. Table 17 shows the following significant ($p < .05$) relationships for black graduates: (1) high positive correlations among Mosby mean score and total average and mean NCLEX score; (2) low positive correlations between mean Nelson Denny score and age and mean NCLEX score (graduates above age 33 achieved a higher mean NCLEX score than graduates below age 32); (3) a low negative correlation between total mean semester tests failed and the NCLEX mean score (the greater the number of tests failed, the lower the NCLEX score); and (4) a high negative correlation between LPN status and mean NCLEX score (LPN graduates achieved a higher mean NCLEX score than non-LPN graduates). In addition, black LPN graduates achieved a significantly higher mean Mosby score and total average than non-LPN black graduates, and older (above 33) black graduates scored significantly higher than the younger group (below 32) on the Mosby and total average. Younger black graduates scored significantly higher on the Nelson Denny test and failed a greater number of semester tests than the older group. The mean Nelson Denny score
TABLE 17

PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS AMONG ALL DEMOGRAPHIC AND ACADEMIC ACHIEVEMENT PREDICTOR VARIABLES AND NCLEX SCORES FOR BLACK GRADUATES

<table>
<thead>
<tr>
<th></th>
<th>NCLEX</th>
<th>MOSBY</th>
<th>LPN</th>
<th>TOTAVR</th>
<th>TOTFAIL</th>
<th>NURND</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NCLEX</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r</td>
<td>1.00000</td>
<td>0.57052</td>
<td>-0.45613</td>
<td>0.68698</td>
<td>-0.36944</td>
<td>0.24327</td>
</tr>
<tr>
<td>p</td>
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</table>

NCLEX: Mean licensure examination standard score; MOSBY: Mean Mosby's Assess Test raw score; TOTAVR: Total mean semester average; TOTFAIL: Total mean number of semester final tests failed; NURND: Mean Nelson Denny raw score; Age: < 32, ≥ 33; LPN: Yes-No (licensed practical nurse).
was not significantly related to Mosby, LPN, total average, or total semester tests failed, and total tests failed was not significantly related to LPN status.

Table 18 presents relationships among all predictor variables and NCLEX scores for white graduates. Table 18 shows the following significant (p < .05) relationships for white graduates: (1) very high positive correlations among Mosby mean score and total average and mean NCLEX score; (2) low positive correlations between mean Nelson Denny score and age and mean NCLEX score (white graduates above age 33 achieved a higher mean NCLEX score than graduates below age 32); (3) a high negative correlation between total mean semester tests failed and the NCLEX mean score (the greater the number of tests failed, the lower the NCLEX score); and (4) a very low negative relationship between LPN status and mean NCLEX score (LPN graduates achieved a higher mean NCLEX score than non-LPN graduates). In addition, white LPN graduates achieved a significantly higher mean Mosby score than non-LPN white graduates, and older white graduates (above age 33) scored significantly higher than the younger group (below age 32) on the Mosby and total average. Younger white graduates scored significantly higher on the Nelson Denny test and failed a greater number of semester tests than the older group. The mean Nelson Denny score showed a low positive relationship to Mosby
**TABLE 18**

PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENTS AMONG ALL DEMOGRAPHIC AND ACADEMIC ACHIEVEMENT PREDICTOR VARIABLES AND NCLEX SCORES FOR WHITE GRADUATES

<table>
<thead>
<tr>
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<th>NCLEX</th>
<th>MOSBY</th>
<th>LPN</th>
<th>TOTAVR</th>
<th>TOTFAIL</th>
<th>NURND</th>
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<tr>
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</tr>
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<td>393</td>
<td>402</td>
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</table>

NCLEX: Mean licensure examination standard score; MOSBY: Mean Mosby's Assessment Test raw score; TOTAVR: Total mean semester average; TOTFAIL: Total mean number of semester tests failed; NURND: Mean Nelson Denny raw score; Age: ≤ 32, > 33; LPN: Yes-No (licensed practical nurse).
and total average, and a low negative relationship to total tests failed, but was not significantly related to LPN status. Total tests failed was significantly related to all predictor variables except LPN status.

Table 19 presents differences in mean NCLEX, Mosby, and Nelson-Denny scores, and differences in mean semester averages and mean number of semester-unit tests failed between black graduates and other minority graduates (hispanic and Asian).

Table 19 shows no statistically significant differences between black and other minority graduates, mean Mosby scores, mean NCLEX scores, mean semester averages, and mean number of semester-unit tests failed (p > .05). A statistically significant difference (p < .05) is shown between the two groups' mean Nelson Denny scores (p = .0355).

Table 20 presents differences in mean NCLEX, Mosby, and Nelson Denny scores, and differences in mean semester averages and mean number of semester-unit tests failed between white graduates and all minority graduates (black, hispanic, and Asian).

Table 20 shows statistically significant differences (p < .05) between white and all minority graduates' (black, hispanic, and Asian) Mosby, Nelson Denny, and NCLEX mean scores, and between mean semester averages and number of semester-unit tests failed (p = .0001). White graduates
<table>
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<th>Variable Compared</th>
<th>Black Graduates (N = 88)</th>
<th>Other Minority Graduates (N = 29)</th>
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<td>253.87, SD = 23.319, X = 40</td>
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<tr>
<td>Variable Compared</td>
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<td>All Minority Graduates (N = 117)</td>
<td>t</td>
<td>p</td>
<td>F</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------</td>
<td>----------------------------------</td>
<td>-------</td>
<td>-------</td>
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<td>SD</td>
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MOSBY: Mosby's Assess Test mean score.
TOTAVR: Mean semester average.
TOTFAIL: Mean number of semester tests failed.
NURND: Mean Nelson Denny score.
NCLEX: Mean NCLEX score.
show a higher mean semester average, higher mean scores of the Mosby, Nelson Denny, and NCLEX, and a lower mean number of semester tests failed than means of these variables for all minority graduates.

Summary

Data collected and organized for all study hypotheses were presented in tables and explained in terms of statistical significance in Chapter IV. A summary of major findings with conclusions, implications, and recommendations for future research are presented in Chapter V.
CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH

Introduction

This study was undertaken to investigate relationships among nursing graduates' academic achievement and demographic variables and scores of the national licensure examination for registered nurses. Predictor variables included: (1) mean raw scores of the Mosby's Assess Test; (2) mean raw scores of the Nelson Denny Reading Test (Form C); (3) mean numerical semester grade; (4) mean number of semester-unit tests failed; (5) age (<32, ≥33); (6) prior practical nursing licensure (LPN, non-LPN); and (7) ethnicity (black, white). The criterion variable was the mean score of the National Council of State Boards of Nursing Licensure Examination (NCLEX). Pearson product-moment correlations, t-tests for differences between means, and multiple regression analyses were performed to determine: (1) the efficacy of Mosby's Assess Test as a valid and reliable predictor of NCLEX scores; (2) significant correlations among semester average, semester tests failed, Nelson Denny Reading Test scores, and NCLEX scores; and (3) significant differences in NCLEX outcomes in relation to age, prior practical nursing licensure, and ethnicity.
Predictor variables were selected by the investigator, in conjunction with a college research and evaluation committee, for study in relation to a 1983-1984 decline in scores of the new licensure examination (NCLEX) for 558 graduates of the college's associate degree nursing program. Selected academic variables were congruent with variables found in historical studies (review of the literature from 1966 to 1983) to be significant predictors of performance on the now-obsolete, former licensure examination. Selected demographic variables were found to be in accordance with current literature which documented changing educational student characteristics (increasing numbers of adult and minority students and students with prior education and experience).

The sparse current literature (review from 1984 to 1987) regarding academic and demographic predictors of performance on the new licensure examination (NCLEX), revealed the need for additional study related to NCLEX prediction, for validation of findings, and for utilization of validated predictors in curricular remediation activities designed to enhance graduates' NCLEX outcomes.

The outcomes of this investigation, as these support or refute previous study findings or present new information, are presented in the following summary of major findings.
Summary of Major Findings

A summary of the data findings is as follows. Scores of the Mosby's Assess Test were found to be significant predictors of nursing graduates' NCLEX performance. For this study, a strong and positive relationship was evidenced between Mosby's raw scores and NCLEX standard scores. Based on 308 scores, it can be stated that NCLEX scores can be predicted within about 5 percent, about 95 percent of the time.

As depicted in the graph in Appendix E, a passing NCLEX score (1600) could be predicted from a Mosby score of as low as 217 or as high as 249, with 229 predicting exactly 1601. This finding is congruent with Michaels (1984) unpublished report that a Mosby raw score of 230 or above is correlated with a passing score of 1600 on the NCLEX. A Mosby score of 229 would, 95 percent of the time, predict a NCLEX score of 1601 plus or minus 86 points (1515 to 1687); however, most scores would fall closer to 1600. Most of the time, a Mosby score of 217 would not be associated with a score as high as 1600 on the NCLEX, and a 249 Mosby score would not be associated with a NCLEX score as low as 1600, but this could occur. Most likely, a 217 Mosby score would yield a 1516 NCLEX score and a 249 Mosby score would yield a 1742 NCLEX score.

Like the conclusion of Wisenbaker and Lee (1985), the findings of this study do not justify the utilization
of a "cutoff" Mosby score for predicting NCLEX scores, as the correlation between the two was not perfect. According to personal communication in August, 1986, with Colin Shaw, Director of Research in a metropolitan community college, if a 249 Mosby cutoff score were set, almost no graduates would fail the NCLEX; however, some graduates who probably would have passed (with a NCLEX score as high as 1735) would have been advised against taking the NCLEX. If a cutoff Mosby score as low as 217 were set, many people would certainly fail (with a NCLEX score as low as 1434); however, some graduates would pass the NCLEX at barely above 1600. A more complicated approach, to establish a cutoff Mosby score based on NCLEX scores predicted from multiple variables including Mosby scores, would hinge upon different variables for different subgroups or different weights on the same variables for different subgroups.

For example, the results of this study showed that, for the studied population, older (≥ age 33) graduates had a significantly higher NCLEX mean score than young graduates (≤ 32), and LPN graduates' mean NCLEX score was significantly greater than the mean score for non-LPN graduates. Should, then, older students and those with an LPN history be, in effect, given a lower Mosby cutoff score? While uncertainty about NCLEX passing rates might be reduced by using either of the stated methods, uncertainties about the fairness of such subjective approaches would be introduced.
Like the findings in past SBTPE prediction studies (Bell and Sanchez 1980; Muhlenkamp 1971), and more recent NCLEX prediction investigations (Frierson 1986; Millican 1986), the results of this study showed that total semester grade average and Nelson Denny Reading Comprehension scores (referenced in the literature as nursing theory grades and SAT verbal scores) were valid predictors of NCLEX success. Total semester average was found to be the most significant predictor of both NCLEX and Mosby Assess Test performance. Significant positive relationships among predictor variables (total average, Nelson Denny test scores, and Mosby scores) showed them to be interrelated NCLEX predictors.

The total mean number of semester-unit tests failed was also highly predictive of NCLEX performance, semester average, and Mosby test scores, and showed a significant, although moderate, relationship to Nelson Denny scores. The significant negative relationships acknowledged that the more semester tests failed, the lower the semester average and the lower the scores on the standardized tests (NCLEX and Mosby). Like total semester average relationships, the mean test failure rate in one semester was significantly and positively related to the mean test failure rate in subsequent semesters. For purposes of this study, students who consistently achieved a minimum passing semester average, without the content knowledge required to
pass all of the semester unit tests, had significantly lower mean NCLEX scores than those students who passed all or most of the unit tests.

The findings of this study related to age and NCLEX performance support Knowles' (1978) implied positive relationship between age or maturation and abilities to reason, analyze, integrate knowledge, and to apply learning in problem-solving situations (abilities which are required for successful NCLEX outcomes). Like the study outcome reported by Quick (1985), results of this investigation showed that older nursing graduates (above age 33) achieved a significantly higher mean NCLEX score than younger graduates (below age 32). In addition, older graduates had a significantly higher mean Mosby score and total semester average, and a significantly lower mean number of semester tests failed than did the younger group. The younger graduates achieved a slightly higher, although significant, Nelson Denny reading comprehension score than the older group. As the Nelson Denny is a timed test which requires rapid comprehension of new non-nursing-related content, this finding may support explanations by Cross (1981), Knowles (1978), and Zemke (1981) regarding an age-related decline in ability to rapidly process new information. As for all graduates, total semester average, followed by the mean Mosby score, were the most significant predictors of NCLEX success for older and younger graduates.
Unlike Bierchen (1981), Felts (1986), and Lambert (1982), the results of this investigation revealed that graduates with prior practical nursing education (LPNs) achieved a significantly higher mean NCLEX score than the non-LPN group. Also, a higher NCLEX failure rate occurred among younger (below age 32) non-LPNs than among older LPNs. In addition, study outcomes showed that LPN graduates achieved significantly higher mean Mosby and Nelson Denny scores than did the non-LPN group. These findings support Knowles' (1970) adult learning theory assumption which acknowledges that experience is a basis for new learning and that understanding is organized around previous encounters with a subject. The study results also lend credence to the findings of one study (Froman and Owen 1984) which revealed a significant positive relationship between age and academic-NCLEX performance. These investigators stated that older students typically have nursing-related experience, and inferred that such experience may enhance academic performance and achievement.

As for all graduates, total average, followed by mean Mosby's Assess Test scores, were the most important predictors of NCLEX performance for LPN and non-LPN graduates. No significant difference was found between the two groups' total semester average and mean number of semester tests failed. The significant differences found
between mean standardized test scores (Mosby, NCLEX, and Nelson Denny) for the two groups may be related not only to LPNs' previously acquired nursing content knowledge and experience, but also to multiple choice test-taking skills acquired and utilized in LPN (vocational) school and in taking the standardized practical nurse licensure examination.

The results of this study relating to ethnicity and NCLEX performance support the findings of an investigation conducted by Rush and Belock (1986), which revealed that minority, foreign-born students had the most failures both in the nursing program and on the NCLEX. Like those findings, the outcomes of this investigation revealed significantly lower mean standardized test scores (NCLEX, Mosby, and Nelson Denny), a significantly lower total semester average, and a significantly greater mean number of semester test failures for black graduates than for white graduates. In addition, the results of this study showed that black and other (hispanic and Asian) minority graduates did not differ significantly in performance on the Mosby, the NCLEX, total average, and semester tests failed. The only significant difference found between black and other minority graduates was a slightly higher mean Nelson Denny score for the other minorities. When white and all minority graduates were compared on mean
standardized test performance, total average, and number of semester tests failed, the results, like the findings upon comparison of white and black graduates' performance, showed that white graduates significantly outperformed the minority groups on all variables (with a significantly lower mean number of semester tests failed).

As shown on the graph "NCLEX Score Trends" (Appendix J), the trend lines for all groups (white, black, all) are slightly upward. However, as discussed in personal communication in August, 1986 with C. Shaw, the trends shown are not strong. The trend line would predict for whites an eleven-point gain (+15 points). For blacks, the eight-point predicted gain would be plus or minus forty-eight points. The slight upward trend does not mean that there is no cause for concern. While average scores are important, the real importance lies in proportions failing or passing the NCLEX. The black students as a group averaged very near the pass-fail (1600) mark. This indicates a chance that small declines in average scores could net a large increase in failures, and large increases in passing rates could occur from small increases in mean scores.

Frierson (1986) stated that minority students generally score below national means on standardized tests and are generally less test-wise than non-minority students, and found that test-taking instruction and team learning
activities improved black graduates' mean licensure examination scores. Support for Frierson's findings may be evidenced in the results of this study, which showed that, for the group of blacks for whom all data were available, practical nurse licensure (LPN) was the most significant predictor of NCLEX performance. Again, this may be related to LPNs' previously acquired nursing knowledge and multiple-choice test-taking skills.

Total average, mean Mosby score, total mean semester tests failed, and age above thirty-three, respectively, were, upon stepwise regression, found to be the most significant predictors of white graduates' NCLEX performance. This finding is congruent with stepwise regression results for the total population studied, with the exception of the group of black graduates.

A process of variable elimination in three stepwise regression procedures was required in order to find any variables, other than LPN (practical nurse licensure), which were predictive of black graduates' NCLEX performance. The first regression showed that the LPN predictor variable yielded the only estimate of NCLEX performance. The second regression, excluding LPN, yielded only the mean Mosby score as an important predictor. Results of the third regression, excluding the mean Mosby score, yielded total semester average and LPN, respectively, as important predictors of
NCLEX performance for black graduates. In view of reported (1) lower mean semester average, lower mean standardized test scores, and a higher mean number of semester tests failed for the black group than for the white group, and (2) predictor variables which yielded the best estimate of NCLEX performance for all graduates (total average, mean Mosby score, mean Nelson Denny score, and age above thirty-three), it was questioned why most, if not all of these variables, on stepwise regression, were not related to blacks' NCLEX performance. Subsequent Pearson product-moment correlation coefficients for all variables showed that total average, Mosby scores, LPN, total tests failed, Nelson Denny scores, and age above thirty-three, respectively, were related to black graduates' NCLEX scores.

Two inferences may be drawn from the stepwise regression results for black graduates in this study. First, the predictor variables did not enter the regression model together because the variables shared a great percentage of the variance in the NCLEX mean score for black graduates. In this case, it could be stated that all predictor variables together were relatively equal in importance, but not necessarily predictive of black graduates' NCLEX performance. The second inference is that all predictor variables together explained only a very small percentage of the variance in the mean NCLEX score for blacks, or, in other
words, all variables combined did not predict, accurately, how blacks performed on the NCLEX. It could be stated that other factors, or variables, not related to the study predictor variables, may have affected the performance of only the black graduates on the NCLEX.

As explained in the review of the literature (Chapter II) in this study, NCLEX test items are written to reflect the nursing graduate's abilities to think critically or analyze situations, to synthesize information, to conceptualize, and to apply learning in problem-solving situations (Pardue 1979; Smeltzer 1982). Investigators in two recent NCLEX prediction studies for black and other minority graduates (Frierson 1986; Rush and Belock 1986) reported that basic verbal abilities, such as reading comprehension, conceptualizing, and analyzing, are integral to success on the licensure examination. Rush and Belock (1986) explained that abilities to abstract and to use deductive reasoning are of major importance in academic and licensure examination success, and added that these abilities can be developed in those students whose cultures have not placed a high priority on such cognitive skills. Woodham and Taube (1986) found that early concept introduction and concept-building throughout an integrated nursing program enhanced achievement of NCLEX success for ADN graduates.
Conclusions

Consideration of the data findings of this study permitted the formulation of the following conclusions.

1. Raw scores of the Mosby's Assess Test can be used to predict NCLEX standard scores. The use of a "cut off" Mosby score is not justified, because a few students who score below the cut off score may be capable of passing the NCLEX.

2. Semester grade average and mean raw Nelson Denny Reading Test (Form C) are predictive of mean NCLEX scores. Among all variables, semester grade average is the most predictive of NCLEX performance.

3. Mean number of semester-unit tests failed appears to be a valid predictor of mean NCLEX standard scores. Students who consistently fail one or more semester tests, but who achieve the minimum passing semester average, may not have the content knowledge, conceptual abilities, or test-taking skills required for NCLEX success. For these students, the probability of NCLEX failure is increased.

4. Older graduates (age thirty-three and above) may tend to score higher than younger graduates (age thirty-two and below) on the NCLEX.

5. Graduates licensed as practical nurses (LPNs) tend to score higher on the NCLEX than non-LPN graduates. Previous nursing education or experience appears to be related to NCLEX success.
6. White graduates, on the average, appear to score higher on the NCLEX than black or other minority graduates. Basic entry-level academic skills may explain ethnic score differences.

7. Prerequisite entry-level reading comprehension abilities are related to NCLEX performance.

Implications

This investigation has produced significant data specific to one associate degree nursing program. The findings suggest the following implications for nurse educators, counselors, and the nursing admissions committee.

1. Mosby's Assess Test should be utilized as an instrument to predict NCLEX scores; however, caution should be exercised in using a Mosby "cut off" score. A positive approach to content review and test-taking strategies is encouraged to enable graduates' optimal performance on the NCLEX.

2. Program treatment of number of semester test failures should be examined.

3. In order to prepare students for the NCLEX, program instruction and evaluation should focus on the problem-solving nursing process and the enhancement of students' higher-level cognitive abilities to conceptualize, think critically, and analyze situations.
4. Prerequisite program entry-level knowledge and skills should be established. In addition, effective remedial mechanisms or strategies should be provided for students or applicants who have less than the required academic skills or abilities.

5. The program should provide for early identification of students at risk for program or NCLEX failure.

Recommendations for Future Research

The following recommendations are made on the basis of the findings and conclusions of this study.

1. Data for this investigation were collected from only the accessible population; therefore, the findings can only be generalized to the specific nursing program studied. As data related to prediction of graduates' performance on the new NCLEX are vital to all undergraduate nursing programs, it is recommended that this study be replicated in such programs in order to enhance validity of the findings. More important would be a grant-funded, national replication to investigate a random sampling of undergraduate programs throughout the United States. A study of such magnitude could establish the validity of Mosby's Assess Test scores and other variables as predictors of NCLEX performance, and the findings could be generalizable.
2. Studies are needed to investigate beginning nursing students' educational and cultural backgrounds, age, work experience, and family responsibilities, conceptual or abstract reasoning abilities, learning styles, values, and motivations for learning as these relate to nursing program achievement, licensure examination performance, and subsequent employment performance. The findings of such studies could provide nurse educators with data vital to planning individual or group instructional strategies and for counseling and initiating referrals for needed assistance or remedial education.

3. Investigations are needed to study the effects of (1) formal and informal peer group learning (in which all students participate in review and sharing of pertinent literature and related clinical experiences), and (2) mentoring (in which more mature and experienced students help those who have lesser maturity and experience) on subsequent motivation and performance. Findings of such studies could effect changes in basic nursing education from the pedagogical to the andragogical style which is appropriate for today's increasingly adult and diverse learning population, and which is conducive to enhancing the higher-level cognitive skills required for professional program, licensure, and practice performance.
CHAPTER BIBLIOGRAPHY


APPENDIX A

NCLEX Test Plan

For complete format see:

Structure of Test Plan

The Table depicting the structure of the test plan demonstrates weightings for the systems and nursing behaviors.* It is presented as a sample of how items might be selected to comply with the established range.

<table>
<thead>
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*Weightings are not specified for cognitive levels.

## STRUCTURE OF TEST PLAN

<table>
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<th>Systems of Client Health Requirements</th>
<th>Nursing Behaviors</th>
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Key: X: Cognitive level at which achievement must be demonstrated.

APPENDIX B

NCLEX Item Type Samples
Phase I: Children – School Age

Case Study #1

Kathy, age 8 is brought to the Public Health Clinic by her mother.

Chief Complaint: "I don't feel like going to school."

Past History: Kathy had rubella and chickenpox prior to entering school. In the past two years, she has had recurrent sore throats. The most recent complaint of sore throat, according to her mother, was five weeks ago. In the past two weeks, Kathy has had no energy, has complained of pain, has requested to stay at home, and appears to have lost weight. Other than immunizations required for school, Kathy has had no health care. Family History: No major illnesses reported. Kathy has three brothers, ages 6, 9, and 11. Kathy's parents divorced three years ago and she has not seen her father since that time. Her mother works 50 to 55 hours per week away from home. Kathy and her family live in a three-room apartment in a government housing project.

Physical Examination and Review of Systems reveal the following problems:

Weight: 5 pounds below normal for height and age.

Abdomen: complains of generalized pain on palpation.

MS: complains of pain in shoulders, elbows, and wrist during active range-of-motion.

Skin: Palpable subcutaneous nodules on knees, scapula, and thoracic spine. Macular rash on anterior trunk. Brown residue in skin creases and under nails.

Head: Mouth—brown and yellow plaque lining gums and teeth. Hair—oily and matted.

Impression: Possible rheumatic fever.

Questions:

**1. Kathy is admitted to the children's unit of the local hospital. Based on knowledge of rheumatic fever and related current adaptation needs and possible complications, the nurse would evaluate which of the following as having first priority in Kathy's initial admission assessment?

A. Reasons for Kathy's apparent lack of hygienic care.
B. Apical pulse rate; coordination of voluntary muscles.
C. Type, intensity, and duration of pain in subcutaneous nodules.
D. Specific foods eaten within the past twenty-four hours.

**2. During the assessment, Kathy's mother states she thought Kathy's possible rheumatic joint pains were "growing pains". In health teaching regarding differentiation of the two pain types, the nurse replies to Kathy's mother:
A. "During rest or sleep, pains from growth are relieved or disappear; whereas, the joint pains of rheumatic fever are not relieved."

B. "There are no characteristic differences between the two types of pain; therefore, neither one can be specified."

C. "Rheumatic pain consistently occurs bilaterally in joints either above or below the diaphragm, whereas growth pains occur only in joints below the diaphragm."

D. "The eight year-old child is developmentally incapable of describing pain characteristics; therefore, it is not possible to differentiate between rheumatic joint pain and 'growing pains' based on Kathy's complaints."

**3. Based on Kathy's developmental stage, tentative diagnosis and related health needs, the nurse would plan to place Kathy in a room with:

A. Eight year-old Jolene, who has playroom privileges and was admitted with superficial bruises resulting from an automobile accident.

B. Eight year-old Alma, who is confined to bed with scarlet fever.

C. Twelve year-old Marta, who is confined to bed with acute systemic lupus erythematosus."
D. Nine year-old Judy, who is up ad lib and admitted for glucose tolerance tests and insulin therapy regulation.

4. Kathy is diagnosed as having acute rheumatic fever. In order to destroy any remaining Group A beta-hemolytic streptococci, penicillin is ordered for Kathy. Just prior to receiving an intramuscular injection, she cries and says to the nurse, "Will the shot hurt? I'm afraid." The nurse should reply:

A. "You're scared? What would your friends think if they knew you were afraid?"

B. "Yes, there will be a little pain, but it will soon be over."

C. "You may go to the playroom as soon as you have your injection."

D. "I will try not to hurt you. If you cry, it will only make it worse."

5. Polyarthritis migrates to Kathy's knees. Considering physical adaptation needs and appropriate nursing management related to this manifestation, the nurse would:

A. Apply elastic bandages and leg splints to increase circulation while immobilizing Kathy's knees.

B. Gently massage Kathy's legs and knees to increase circulation and promote healing.
C. Perform passive range-of-motion and encourage Kathy to ambulate frequently to prevent contractures.

D. Place a bed cradle over Kathy's legs to prevent physical or material contact.

**6. In analyzing the school-age child's problems in adapting to hospitalization, the nurse acknowledges which of the following aspects to be the most difficult for Kathy to accept:

A. Separation from her mother and her family.

B. Separation from her friends and possible alienation from her established group.

C. Absence from school, possibly falling behind in homework, and failing her grades.

D. Restricted mobility, possible bodily injury, and lack of control over self-care.

**7. The nurse recognizes Kathy's nervousness, weakness, and emotional instability as indications of Sydenham's Chorea, a disorder associated with the rheumatic process. If this condition worsens and clinical manifestations increase and are intensified, nursing actions would include:

A. Encouraging Kathy to build her strength, vent her emotions, and utilize stored excess energy by scheduling increased playroom time with school-age children.
B. Preventing complications by providing absolute rest, padded bedding, spoon-feeding, and a diet high in calories, protein, and iron.

C. Alleviating Kathy's inferiority feelings by providing pencils, paper, and extra study time for keeping up with her homework.

D. Preventing further psychological damage by removing all visiting restrictions, arranging psychological counseling, and instituting a self-care regimen for Kathy.

**8. Kathy is prescribed large-dose A.S.A. (acetylsalicylic acid) therapy. The nurse should observe Kathy for all of the following indications of salicylate toxicity except:

A. Erythema marginatum; cardiac murmur.
B. Drowsiness; nausea; vomiting.
C. Hyperpnea; purpuric manifestations.
D. Tinnitus; gastric bleeding.

**9. In nursing evaluation of Kathy's progress, which of the following manifestations would indicate increasing severity in Kathy's health problem?

A. Decreasing erythrocyte sedimentation rate.
B. WBC count of 9,000 per cubic millimeter.
C. Orthopnea and peripheral edema.
D. Pulse rate 88 and negative C-reactive protein.

**10.** Kathy is prescribed cardiac glycoside (digoxin) and steroid (cortisone) therapy. Important nursing actions related to long-term steroid administration include each of the following except:

A. Prevent exposure to infection; check urine for glucose.

B. Administer with antacid or milk; assess for emotional lability.

C. Monitor blood pressure, daily weight, and skin for any changes.

D. Report possible infectious processes suggested by high temperature elevations.

**11.** Lasix (Furosemide) is added to Kathy's medication regime. Of the following, which are the most important nursing actions related to simultaneous administration of Lasix and Digoxin:

A. Observe Kathy for headache, nausea, muscular weakness, disordered vision, and changes in apical heart rate and rhythm.

B. Monitor Kathy for changes in weight, skin turgor, texture of mucous membranes, and radial pulse rate.

C. Assess Kathy for absent or unequal peripheral pulses, ecchmoses, cyanosis, or numbness/tingling of the lower extremities.
D. Report elevated temperature, flushed face, anorexia, and bounding radial pulses.

**12. Potassium chloride is added to Kathy's I.V. solution. In order to prevent possible life-threatening complications resulting from I.V. KCL administration, the nurse ensures each of the following except:

A. Kathy's urinary output is greater than 30 ml. per hour.
B. Kathy's cardiac status is monitored and recorded.
C. The solution is infused at a rapid rate.
D. The KCL is thoroughly mixed in the I.V. solution.

**13. As Kathy's health status improves, she indicates she is bored and asks the nurse for "something entertaining to do." The nurse requests that Kathy decide on an activity, and presents all of the following options to Kathy for her selection except:

A. Finger painting; stringing beads; making puppets.
B. Knitting; leather crafts; clay modeling.
C. Reading; playing jacks; playing guessing games.
D. Playing checkers, scrabble, or monopoly with her roommate.

**14. At discharge, Kathy's mother requests information about Kathy's home care. The nurse should reply:

A. Kathy must have antibiotic therapy indefinitely and exactly as ordered.
B. Kathy is now immune to further problems related to rheumatic fever.

C. There are no restrictions on Kathy's activities at home or at school.

D. Kathy should be provided a diet high in carbohydrates and fats and low in protein.
Test Item

Cognitive Levels

1. Knowledge:

2. Comprehension: Question 7

3. Application: Questions 2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14

4. Analysis: Questions 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

5. Synthesis: Question 13

6. Evaluation: Questions 3, 8, 9

# TEST ITEM STRUCTURE

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APPENDIX C

Plot of NCLEX Score by Nelson Denny Score
for All Graduates
Plot of NCLEX Score by Nelson Denny Score for All Students

Legend:  A = 1 obs  
          B = 2 obs, etc.
APPENDIX D

Plot of NCLEX Score by Total Semester Average for All Graduates
Plot of NCLEX-TOTAVR

Legend:  
A = 1 obs  
B = 2 obs, etc.
APPENDIX E

Plot of Mosby's Assess Test and NCLEX Scores with Corresponding Regression Line for All Graduates
Plot of Mosby-NCLEX

Legend:  
A = 1 obs  
B = 2 obs, etc.
MOSEBY ASSESSMENT PREDICTING NCLEX SCORES

\[ \text{NCLEX} = (\text{Mosby} \times 7.06 \pm .38) - 15.1 \]
APPENDIX F

Plot of Semester-Unit Tests Failed and NCLEX Scores for All Graduates
Plot of NCLEX-TOTFAIL

Legend:  A = 1 obs
         B = 2 obs, etc.
APPENDIX G

Plot of Age and NCLEX Scores for All Graduates
Plot of NCLEX-Age

Legend: A = 1 obs
B = 2 obs, etc.

1 = ≤ age 32
4 = ≥ age 33
APPENDIX H

Plot of NCLEX Scores by LPN Status for All Graduates
Plot of LVN-NCLEX

Legend:  
A = 1 obs  
B = 2 obs, etc.

1 = LPN  
2 = Non-LPN
APPENDIX I

Plot of NCLEX Scores by Ethnicity: Whites and Blacks and Whites and All Minorities
Plot of NCLEX Scores by Ethnicity (Whites and Blacks)

Plot of NCLEX-ETH

Legend:  A = 1 obs
B = 2 obs, etc.

1 = Whites
2 = Blacks
Plot of NCLEX by Ethnicity (Whites and All Others)

Plot of NCLEX-ETH

Legend:  
A = 1 obs
B = 2 obs, etc.

1 = Whites
6 = All Minorities
APPENDIX J

NCLEX Mean Scores by Sitting and Ethnicity

with NCLEX Score Trend
NCLEX SCORES BY SITTING AND ETHNICITY

NCLEX SCORE TREND
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