

THE RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS (SES) AND THE
NATIONAL COUNCIL LICENSURE EXAMINATION FOR REGISTERED NURSES:
COMPARING SES INDICATORS IN MEDIATED AND
MODERATED LOGISTIC REGRESSION

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By

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EVALUATION AND MEASUREMENT

THE RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS (SES) AND THE NATIONAL COUNCIL LICENSURE EXAMINATION FOR REGISTERED NURSES: COMPARING SES INDICATORS IN MEDIATED AND MODERATED LOGISTIC REGRESSION (179 pp.)

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Passing the National Council Licensure Examination (NCLEX) is required for a graduate of an accredited nursing program to practice nursing. The current study investigated first time student success on the NCLEX-RN, which is the examination used to grant licensure to Registered Nurses (RNs) after graduation from an accredited institution such as a school or a college of nursing. Universities, colleges, faculty, students, parents, healthcare employers, the National Council of States Boards of Nursing (NCSBN), and society in general have a vested interest in the success of nursing students on the NCLEX-RN. It is imperative that nurses are properly prepared and competent in providing safe and reliable healthcare services. Failure to pass the NCLEX-RN prevents practice as an RN, resulting in potential financial hardship, professional embarrassment, and a continued shortage of qualified RNs.

Existing data from nursing students ($N = 1,176$) at a large, Midwestern university were analyzed. The main purpose of this study was to examine the relationship between Socioeconomic Status (SES), the ACT, and the NCLEX-RN. Through moderation and mediation logistic regression models, the above relationships were investigated. Additionally, Conditional Process Analysis was used to gain a more in-depth understanding of the complexity of the relationship between SES, ACT, and the NCLEX-

RN. Proxies of SES were explored, which included: (1) Pell Grant Eligibility, (2) Student Race, (3) College Generation (i.e., first-generation or non first-generation), and (4) Zip Code.

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CHAPTER I

INTRODUCTION

In this chapter, a brief overview of the existing literature is provided on the need, rationale, and purpose of this study. The contribution to the literature, the significance, and indications are discussed. Finally, the research questions and goals are also outlined.

Overview

Passing the National Council Licensure Examination (NCLEX) is required for a graduate of an accredited nursing program to practice nursing. There are two forms of the NCLEX—the National Council Licensure Examination for Registered Nurses (NCLEX–RN), and the National Council Licensure Examination for Practical Nurses (NCLEX-PN). The NCLEX-PN is the examination used to grant licensure to Practical Nurses after graduation from an accredited institution. Most practical nursing programs are 12 months in duration. The current study investigated first time student success on the NCLEX–RN, which is the examination used to grant licensure to Registered Nurses (RNs) after graduation from an accredited institution such as a school or a college of nursing.

Accredited institutions in higher education can offer the RN degree via an Associate’s Degree in nursing (two years), a diploma of nursing (three years), or a baccalaureate degree of nursing (BSN; typically four years). There are three commonly offered programs for students who wish to achieve their BSN. These include the traditional four-year degree, the RN to BSN, and an accelerated nursing degree. The RN to BSN program is designed for the associate or diploma degree nurses. The accelerated

program is designed for post baccalaureate students who wish to change professions and become a nurse. Both traditional and the accelerated program students have to pass the NCLEX–RN in order to be employed as a nurse. RN to BSN students have already passed the NCLEX–RN. For the current study, the focus was on the first time test takers of the NCLEX–RN; the sample included traditional and accelerated BSN graduates.

Universities, colleges, faculty, students, parents, healthcare employers, the National Council of States Boards of Nursing (NCSBN), and society (i.e., stakeholders) in general have a vested interest in the success of nursing students on the NCLEX–RN. The objective for nursing programs is to successfully graduate students who can pass the NCLEX–RN on the first try, and practice in the healthcare setting as knowledgeable, safe, and competent nurses. The populous requires properly prepared and competent nurses to provide safe and reliable healthcare services. Failure to pass the NCLEX–RN prevents practice as an RN, resulting in potential financial hardship, professional embarrassment, and a continued shortage of qualified RNs (Juraschek, Zhang, Ranganathan, & Lin, 2012).

Rationale and Purpose

In this section, the three main variables examined for this research study are briefly discussed. A more in-depth discussion is included in Chapter 2, the Literature Review. The NCLEX–RN, as introduced above, is discussed as the main outcome of interest, with variables that are hypothesized to contribute to success or failure on the exam (i.e., predictors or independent variables) as the focus of the literature. The brief discussion of the NCLEX–RN leads to an introduction of the ACT and Socioeconomic

Status (SES) of students, which are hypothesized to influence the outcome on the NCLEX–RN.

NCLEX–RN

As a service to their stakeholders, an in-depth understanding of the variables that influence the outcome on the NCLEX–RN is essential for colleges and schools of nursing. Additionally, states and their accompanying State Boards of Nursing are vested in the success of qualified students on the NCLEX–RN to meet the growing demand for skilled nurses in all healthcare settings. Schools, colleges, and universities use many different variables to determine the best candidates. For instance, high school GPA and scores on the ACT and/or the SAT are two commonly used variables in determining a candidate's eligibility for a specific institution. Furthermore, researchers have evidenced that these, and other student-specific variables, are predictive of the scores on the NCLEX–RN. A few examples of these variables are gender, age, program of study, and ethnicity (Beeman & Waterhouse, 2001; Daley, Kirkpatrick, Frazier, Chung, & Moser, 2003; Haas, Nugent, & Rule, 2004; Harris, 2006).

Equally important is accreditation of schools and colleges of nursing, which is often, to some degree, based on the first time NCLEX–RN passage rate (Accreditation Commission for Education in Nursing [ACEN], 2013; American Association of Colleges of Nursing [Commission of Collegiate Nursing Education, CCNE], 2013). National and state accrediting organizations use the NCLEX–RN as a benchmarking tool to compare colleges and schools of nursing. Schools and/or colleges of nursing may seek accreditation from three different national accrediting bodies (see the following

paragraphs). Accreditation, although not required, is highly recommended as it fosters appropriate and up-to-date curricula and sets a standard for practice. Additionally, graduate programs often require students to have graduated from an accredited undergraduate program. Finally, many states require nursing programs within the state to be accredited. The decision as to which accrediting body to use is determined by each individual nursing program.

For accreditation of a RN program, the Accreditation Commission for Education in Nursing (ACEN) requires, “The program’s three-year mean for the licensure exam pass rate will be at or above the national mean for the same three-year period” (ACEN, 2013, p. 20). The Commission of Collegiate Nursing Education (CCNE) states for accreditation that:

The NCLEX–RN pass rate for each campus/site and track is 80% or higher for first-time takers for the most recent calendar year. However, if the NCLEX–RN pass rate for any campus/site and track is less than 80% for first-time takers for the most recent calendar year, (1) the pass rate for that campus/site or track is 80% or higher for all takers (first-time and repeat) for the most recent calendar year, (2) the pass rate for that campus/site or track is 80% or higher for first-time takers when the annual pass rates for the three most recent calendar years are averaged, or (3) the pass rate for that campus/site or track is 80% or higher for all takers (first-time and repeat) when the annual pass rates for the three most recent calendar years are averaged. (2013, p. 20)

The Commission of Nursing Education Accreditation (CNEA) of the National League of Nursing (NLN), by late 2015 or early 2016, will have implemented a new accreditation process for schools and colleges of nursing. Like other accrediting bodies, it is expected that they too will have a contingency for accreditation based on NCLEX–RN outcomes.

Not only do accrediting organizations use school/program first time NCLEX–RN pass rates to make high-stakes decisions, prospective students and their families/relatives consider NCLEX–RN scores when selecting a nursing school/program. As a result, nursing programs are constantly revising and updating curricula. Many times, the revisions to the curricula occur in hopes of improving first time NCLEX–RN pass rates (Crow, Handley, Shaw Morrison, & Shelton, 2004). Having an in-depth understanding of the variables that predict NCLEX–RN scores can support appropriate and data-driven curricular changes.

Socioeconomic Status (SES)

SES is a variable commonly used to predict post-secondary outcomes (Association for the Study of Higher Education [ASHE], 2007; Oakes & Rossi, 2003; Sirin, 2005). However, it has been demonstrated that the appropriate measurement of SES is a complex task. These difficulties include social philosophy, social reasoning, real-world influence, and statistical considerations (Sewell, 1942). SES can be defined as “the extent to which individuals, families or groups have access (either realized or potential) to, or control over valued resources, including wealth, power and status” (Van Ewijk & Slegers, 2010, p. 138). As descriptions vary by discipline and research context,

the above definition can be referenced as the conceptual meaning of SES for the current study.

Following the conceptual definition, measurement of any variable (i.e., including a complex one such as SES) requires an operational definition and determining the level and method of measurement (Crocker & Algina, 1986). There is no consensus as to the best method used in measuring SES (Oakes & Rossi, 2003; Shavers, 2007). Oakes and Rossi (2003) noted that the abovementioned process for SES is one of the most difficult and contentious topics in social science research. With no consensus on the optimal method to measure SES, researchers in their respective disciplines need to consider the level of measurement (e.g., ordinal, interval) and the range of proxies (i.e., substitutes) available before conducting any analyses. In the current study, proxies for SES include: (a) Pell Grant Eligibility, (b) Student Race, (c) Parental Education, and (d) Home Zip Code. In Chapter 2, the Literature Review, a more comprehensive discussion on the definition and method/level of measuring SES is presented.

The ACT and NCLEX–RN

The NCLEX–RN is developed, administered, and retained by the National Council of State Boards of Nursing (NCSBN), who is responsible, in part, for ensuring the public’s safety in nursing. To accomplish this, graduating nursing students are required, as candidates for licensure, to pass the NCLEX–RN. Passing the exam indicates that a candidate has the competencies needed to perform safely and effectively as a newly-licensed, entry-level nurse. Every three years, the NCSBN reviews three aspects of the NCLEX–RN to determine if the test is performing as desired: (a) the

historical passing standards are reexamined (e.g., summarizing the psychometric properties of the NCLEX–RN); (b) the criterion-related validity is evaluated through the input of seasoned nurses, new nurses, and educators; and (c) the predictive validity (i.e., a type of criterion-related validity) of the scores on the exam are reviewed (Crocker & Algina, 1986).

Predictive validity of the scores is assessed (i.e., broadly) via an investigation of educational readiness of high school graduates who express interest in the nursing field. Educational readiness is based largely on the ACT. Examining the predictive validity of the ACT occurs when the criterion, in this case the NCLEX–RN scores, occurs after the test (i.e., in this case, the ACT; Cronbach & Meehl, 1955). The governing bodies and organizations in nursing have used the ACT as a predictor of NCLEX–RN outcomes, which has been supported through quantitative and qualitative research (Daley et al., 2003; Endres, 1997; Frey & Detterman, 2004; Koenig, Frey, & Detterman, 2008; Thorndike, 1949; Waterhouse, 2001).

ACT and SES

Some researchers claim that post-secondary admission tests such as the ACT and SAT are inherently measures of students' SES (Kohn, 2001; Zwick, 2004). Others have claimed that when controlling for SES, the predictive power of these admissions tests on students' freshman GPAs are not statistically or practically significant (Biernat, 2003; Crosby, Iyer, Clayton, & Downing, 2003). More recent findings suggest these claims to be in error. Sackett, Kuncel, Arneson, Cooper, and Waters (2009), through a collaboration of 41 colleges and a sample size of 155,191 students, investigated the

complex relationship among SES, higher education grades, and ACT/SAT scores. The results are reviewed below, as this study is an important bridge between the confusion surrounding the state of the current literature (i.e., noted above) and the study outlined in subsequent chapters.

In an attempt to define how researchers should conceptualize SES as it relates to the predictive validity of the ACT/SAT on post-secondary academic achievement, Sackett and colleagues (2009) examined the relationship between the abovementioned variables in two different ways. First, their findings indicated that the correlation between the admission tests and higher education GPAs was only minimally impacted when controlling for SES. That is, the correlation between ACT/SAT and grades decreased minimally from .47 to .44 with SES held constant. In their second analysis, the researchers examined the relationship between SES and post-secondary grades, with SES influencing ACT/SAT scores, which consequently influenced post-secondary grades. In other words, the influence of SES on higher education grades as mediated by ACT/SAT scores was analyzed. The results suggested that “SES had a near-zero relationship with grades other than through this SES-test [ACT/SAT]-grade [higher education grade] chain of relationship” (Sackett et al., 2009, p. 17). Thus, a mediation model with ACT/SAT as the mediator (e.g., the model presented by Sackett and colleagues) was chosen to add to the literature involving the relationship between SES, ACT, and post-secondary success (e.g., NCLEX–RN).

Goals and Research Questions

The research questions addressed fall into three distinct, but interdependent categories. These include: (a) Moderation, (b) Mediation, and (c) Conditional Process Analysis. First, because of the multiple definitions of SES that exist in research and the countless methods used to measure the construct, different variables that have been used as proxies for SES were investigated in a series of moderation and mediation models (i.e., separately). There was evidence of a moderating and mediating effect; therefore a conditional process analysis was implored, through PROCESS a Macro for SPSS Version 23, to investigate a model that incorporates both simultaneously. A brief description of these categories is presented below, and a detailed explanation is provided in Chapter 3, Methodology.

A phenomenon is best understood when research allows not only for the answer to, “Does *X* effect *Y*?” but also *how* *X* exerts its effect on *Y* (Moderation), and *when* *X* affects *Y* (i.e., and when it does not; Mediation). “Conditional process analysis is used when one’s research goal is to describe the conditional nature of the mechanism or mechanisms by which a variable transmits its effect on another and testing hypotheses about such contingent effect” (Hayes, 2013, p. 10). In other words, conditional process analysis is used to determine if a relationship is both mediated and moderated between two or more variables. Conditional process analysis is a form of path analysis that allows for investigation of complex models which suggest both mediator and moderator components (e.g., mediated moderation).

Moderator Questions

The following questions addressed the relationship between ACT and NCLEX–RN, and the hypothesized moderator of SES. As mentioned previously, variables representative of SES were tested for a moderating effect. The goal of these research questions were to determine whether SES is a moderator of the relationship between ACT and NCLEX–RN, and if so, which of the below substitutes demonstrates this moderator effect.

1. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on Pell Grant Eligibility controlling for pre-admission GPA, college science GPA, final college GPA, gender, age, and program type?
2. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on Student Race controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?
3. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on College Generation controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?
4. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on Home Zip Code, controlling for pre-

admission GPA, college science GPA, final college GPA, age, gender, and program type?

Mediator Questions

The following questions addressed the relationship between nursing student SES and NCLEX–RN scores, and the hypothesized mediator of ACT scores. The ACT exam scores, as mentioned previously, are often considered one of the strongest predictors of NCLEX–RN scores. However, there is debate in the literature as to whether ACT scores are truly a measure of knowledge/post-secondary preparedness, or if the scores are influenced by a student's SES (Biernat, 2003; Crosby et al., 2003; Sackett et al., 2009). Through the following question, using the previously discussed proxies, the goal was to determine whether the predictive power of ACT scores on NCLEX–RN scores is a byproduct of the suggested influence of SES on ACT scores.

1. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using Pell Grant Eligibility controlling for pre-admission GPA, college science GPA, final college GPA, gender, age, and program type?
2. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using Student Race controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?
3. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using College Generation controlling for pre-

admission GPA, college science GPA, final college GPA, age, gender, and program type?

4. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using Home Zip Code controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?

Conditional Process Analysis

Some of the hypothesized mediation and moderation effects were statistically significant. Therefore a conditional process analysis was used to suggest the best fitting model between SES, ACT scores, and NCLEX–RN outcomes.

1. What is the best fitting model/relationship between SES, ACT scores, and NCLEX–RN scores through a Conditional Process Analysis?

Implications

The results indicate that two of the proposed proxies of SES are substantially influential in the relationship between ACT, NCLEX–RN, and the covariates. In this section, the implications for stakeholders such as students, parents, faculty, administrators, and the nursing community as a whole are briefly discussed. A more in-depth discussion occurs in Chapter 5.

Students and their parents are often considered the front line stakeholders (Juraschek et al., 2012). The findings of this research reinforce the education gap caused by SES. That is, lower SES students are more likely to have difficulties in higher education and the NCLEX–RN. Being that the findings are similar to higher education in

general, the importance of disseminating these findings to students and their parents is crucial. It is challenging to change ones SES; however, apprising lower SES students and their parents of the results from this research study may allow them to prepare for the additional challenges.

As discussed in Chapter 2, having students who are successful on the NCLEX–RN is essential for nursing programs. High first time pass rates are required by national and state organizations (ACEN, 2013; CCNE, 2013). The findings of the current study indicate that nursing programs need to be proactive in addressing the education gap between different levels of SES. Administrators and faculty are implored to be proactive in helping lower SES students to be successful on the NCLEX–RN.

Findings from this study have important implications for the nursing community and specifically nursing researchers. The hypothesized predictors of the NCLEX–RN performance are nearing exhaustion and have become repetitive. This study goes beyond a cursory examination of correlates and provides experienced and novice researchers alike with evidence to support the selection of not only the correlated variables, but a “prescription” for variable performance depending on the chosen indicator. An adoption by the nursing profession that the outcome on the NCLEX–RN is based on inherent qualities of the students and not just a laundry list of predictors is needed. Such a paradigm shift is needed to best support all students and ensure diversity in the nursing profession.

Even with the breadth of information, the NCLEX–RN is continuously changing, and historically increasing in difficulty (National Council of State Boards of Nursing

[NCSBN], 2015c). The current research study is essential to build upon the research repository. Thus, the main goals of the current study were to examine and compare a range of variables that have been used in the literature as indicators of SES in a series of mediation and moderation models, and using these indicators in conditional process models to explain the complicated relationship between SES, ACT, and NCLEX–RN outcomes.

CHAPTER II

LITERATURE REVIEW

The beginning of this chapter contains an overview of the conceptual framework. The remainder of the chapter includes a review of the literature including an overview of the proposed variables. Additionally, the research questions are linked to the literature.

Conceptual Framework

In this section, the focus will be on CAPSES—a conceptual framework that defines socioeconomic status (SES) as a function of a student’s Material Capital, Human Capital, and Social Capital. First, social theory is discussed, as it is the foundation of CAPSES. Next, the three distinct components of CAPSES are outlined, followed by a synopsis of how they are related. Finally, the relevance and appropriateness of CAPSES to this study are highlighted.

Coleman’s (1988) social theory is the foundation for CAPSES. Social theory, according to Coleman, attempts to define and explain the functioning and organization of social systems, which is based on two kinds of elements and their interrelatedness. These elements are actors and resources. Through an understanding of these elements and their covariance, Coleman suggested that SES is not only a measure of access to resources but contingent upon: (a) material capital and or belongings (e.g., income, investments, and property); (b) personal qualities (e.g., individual talents, appearance and knowledge; and (c) one’s community connections and the prestige (Oakes & Rossi, 2003). Oakes and Rossi defined access to resources as Material Capital, individual talents and knowledge as Human Capital, and community connections as Social Capital.

At the center of CAPSES is the following formula: $SES = f(\text{Material Capital, Human Capital, and Social Capital})$. Material Capital refers to owned materials, such as homes, cars, appliances, stocks, salary. Human Capital refers to the observable qualities of an individual, which may include height, weight, physical appearance, and skills (e.g., being a nurse or a musician). Social Capital is the capability of an individual to create opportunities through membership in social network and groups. The personal and professional connection one creates can lead to increased social capital (Oakes & Rossi, 2003). Some simple ways to measure social capital would include memberships in clubs and social ties in the community. In addition, the authors noted that social capital can be viewed as an individual, family, or household trait.

Social capital is comprised of privileged knowledge, resources, and information achieved through social networks (Walpole, 2003). This plays an important role in higher education as it serves as a framework to make decisions related to choosing universities, majors, and social experiences. It is hypothesized in the literature that the more social capital a student possesses, the more likely they are to enroll, attend, and be successful in higher education. Additionally, authors have noted that faculty members in higher education may value high social capital students over low social capital students, and therefore are more likely to foster the success of the higher social capital students (Walpole, 2003). In other words, the values, attitudes, and beliefs intrinsic in higher social capital students naturally boost their likelihood of post-secondary success. This phenomenon is hypothesized to occur related to the privileged knowledge, resources, and

social networks that these higher social capital students possess, and the affinity that these qualities foster with faculty members.

In order to demonstrate how the three major “capitals” of CAPSES are present in the current study, indicators of SES that align with *Material*, *Human*, and *Social* capital were selected, and are common in the SES literature. Pell Grant Eligibility is based partially on Estimated Family Contribution (EFC) and serves as the estimate of material capital. Student Race and College Generation (i.e., first-generation or non first-generation) are estimates of human capital. College Generation and Zip Code act as the estimates of social capital (see Figure 1). A brief introduction into the suggested indicators of SES is given in this section. A more detailed discussion about each variable occurs later in this chapter and in Chapter 3. The suggested proxies were selected as they have been used in previous research, are highly correlated with socioeconomic status, and are available for analysis.

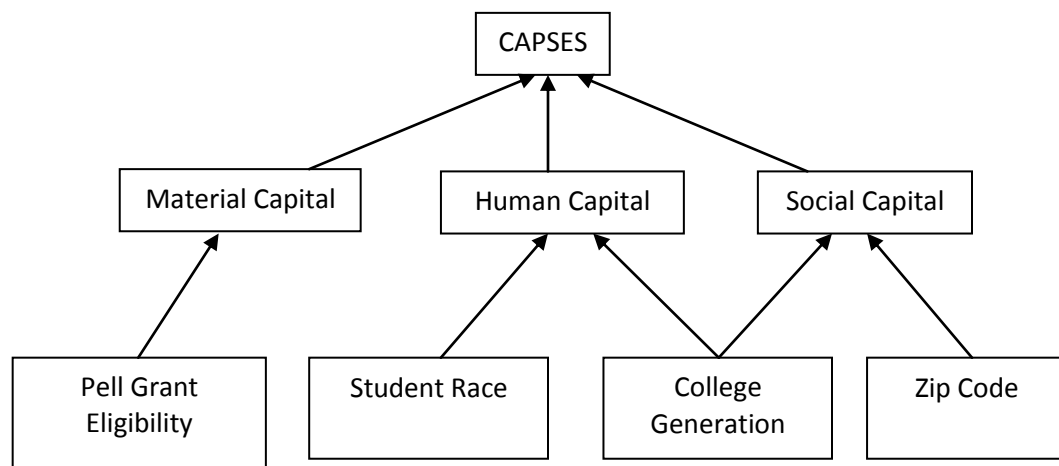


Figure 1. A visual representation connecting CAPSES, its components, and the hypothesized proxies for SES.

Estimated Family Contribution is based on The Free Application for Federal Student Aid (FASFA). The amount a student and his or her family are expected to contribute to higher education for a specific year determines EFC. The formula used to calculate Estimated Family Contribution takes into account the family income and the cost of the chosen university. The range of Estimated Family Contribution is zero to 99,999. A student's Material Capital is approximated using Pell Grant Eligibility as EFC was not available. Pell Grant Eligibility is based on EFC and therefore is often used as a substitute for EFC.

Human Capital is estimated from student race and College Generation. Race is appropriate as it represents the student's physical appearance, which is a key aspect to how human capital is defined (Oakes & Rossi, 2003). Another key aspect to human capital is an individual's skills. A student's parental education (i.e., College Generation) would likely influence his or her skills. As mentioned earlier, not only does race and parental education fit with CAPSES, they are common proxies for SES in the literature.

Racial minorities represent a higher proportion of lower SES when compared to the general college population. Race continues to be a variable that has significance in high school graduation, college dropout rates, and college success (Clark, Ponjuan, Orrock, Wilson, & Flores, 2013; Labovitz, 1975). Research has shown that SES and race act as risk factors for attrition from higher education (Gamez-Vargas & Oliva, 2013; Heisserer & Parette, 2002; O'Keeffe, 2013). Research has also indicated that race is highly correlated with both the student's neighborhood and school SES (Labovitz, 1975). Similar to certain racial minorities, first-generation college students have higher attrition

rates. Thus racial minority students who also have parents with low-paying occupations or parents who did not attend college tend to be less successful in enrolling and graduating from college (The Association for the Study of Higher Education [ASHE], 2007).

Finally, Social Capital is estimated by a combination of parental education and the student's Zip Code. Literature has demonstrated that parental education and Zip Code have been used as indicators for SES. Furthermore, both encompass the key aspects of Social Capital (i.e., represent potential social and community ties). Martens and colleagues (2014) found that students living in public housing have statistically lower educational outcomes. Moreover, the location of the public housing is also influential to students' academic success. Students in public housing from wealthier neighborhoods (i.e., high mean neighborhood SES) had better educational outcomes when compared to students living in public housing from poorer neighborhoods (i.e., low mean neighborhood SES).

Directly tied to CAPSES is the education gap created by SES. It is well documented in the literature that lower SES students are less likely to be successful in higher education, and this is the basis of the education gap (e.g., Pennebaker, Gosling, & Ferrell, 2013; Summers & Hrabowski, 2006; Tekian & Hruska, 2004). Furthermore researchers have found that students with low SES backgrounds have lower educational aspirations, persistence rates, and educational attainment than their peers from higher SES backgrounds prior to and during college (Strayhorn, 2009; Walpole, 2003). Additionally social scientists, especially over the last century, have discussed the innate

advantage of having parents and grandparents who are of higher social class. Social reproduction, as discussed more recently by Bourdieu (1999), originated by Marx (1887), suggests that eliminating an educational gap created by SES is not likely and surely not easily accomplished given the predictability of economic advantage. As CAPSES alludes to, social reproduction theory further supports that individuals with the Material Capital, Human Capital, and Social Capital generated by their relations (i.e., parents and grandparents) are markedly more advantaged to be more successful in life and higher education.

NCLEX–RN

With an understanding of the conceptual framework, a more in-depth discussion on the three variables of interest is presented in this section. The outcome variable in the current study, the NCLEX–RN, is discussed first. Attention is given to a thorough review of the development, administration, passing standards, item formats, scoring, reliability, and validity. The following sections elaborate on the other key variables: ACT and SES. ACT is discussed as the hypothesized mediator variable and SES is representative as both an independent and a moderator variable.

Passing the National Council Licensure Examination (NCLEX) is the final step a graduate of an accredited nursing program must take to become a nurse. There are two forms of the NCLEX—the National Council Licensure Examination for Registered Nurses (NCLEX–RN), and the National Council Licensure Examination for Practical Nurses (NCLEX-PN). The NCLEX-PN is the examination used to grant licensure to Practical Nurses after graduation from an accredited institution. Most practical nursing

programs are 12-months in duration. The NCLEX–RN is the examination used to grant licensure to Registered Nurses after completion of an accredited program and is the focus of this study.

National Council of State Boards of Nursing (NCSBN)

The NCLEX is developed, administered, and owned by the NCSBN. The NCSBN is a nonprofit organization whose goal is to bring a unified voice to the state boards of nursing, in addition to facilitating public health, safety, and welfare of patients and nurses. The NCSBN has indicated that to protect society as a whole, from a nursing perspective, they ensure that nurses entering the profession have the minimum knowledge, skills, and attitudes to practice safely (NCSBN, 2015c). The NCLEX started in 1978 with the development of the NCSBN. Prior to that, each state determined individual requirements for licensure. The NCSBN initiated the first computerized adaptive test (CAT) version of the NCLEX in 1994. Nearly 2.5 million U.S. candidates have taken the CAT NCLEX–RN since 1994 (NCSBN, 2015c).

As mentioned previously, the NCSBN is charged with ensuring the public's safety. To accomplish this goal, the NCSBN requires a candidate for licensure to pass the NCLEX–RN. A candidate for licensure that passes the NCLEX–RN is believed to have the minimal competencies required to perform safely and effectively as a newly licensed, entry-level nurse. To become a candidate, the student must meet the criteria for graduation from an accredited nursing program. Upon graduation, the nursing program submits paper work to the appropriate state board of nursing. After receiving and reviewing the paper work, the state board contacts the student and informs them that he

or she is a candidate for licensure, and is permitted to take the NCLEX–RN (NCSBN, 2015c).

Setting the NCLEX Passing Standards

The NCSBN revisits the test plan, the blueprint, and the passing standards every three years. This is performed because both the science and art of being a nurse is constantly changing. Additionally, the advancement of medical knowledge and the nursing profession is constantly evolving. These revisions are criterion-referenced and based on a “panel of judges.” Criterion-related validity is a type of validation evidence used in situations where the test developer desires to draw an inference from the examinee’s test score to performance on some real behavioral variable of practical importance (Dimitrov, 2009). The “panel of judges,” which includes the input of seasoned nurses, new nurses, and nurse educators, reviews the historical passing standards and annual summaries. Finally, predictive validity, a type of criterion-related validity, is considered by investigating the educational readiness of high school graduates who express interest in nursing. The NCSBN uses the ACT as predictive validation evidence. Evidence of predictive validity occurs when the criterion, in this case passing the NCLEX–RN successfully, occurs after the predictor (i.e., the ACT) is administered (Cronbach & Meehl, 1955). This is one of the major reasons the relationship between the NCLEX–RN and the ACT is the focus of this research study.

On April 1, 2010, the NCSBN (2015b) increased the passing standard from $-.21$ to $-.16$ logits. On April 1, 2013, the passing standard was increased from $-.16$ to $.00$ logits. A logit is defined, by the NCSBN, as a unit of measurement to report relative differences

between candidate ability estimates and item difficulties. This means that it is a ratio level variable that correlates the item difficulty with the student's ability. A logit, in Item Response Theory, is used to measure relative differences between candidate ability estimates and item difficulties (Bond & Fox, 2013).

Forms and Number of Assessment Items

According to the NCSBN (2015c), the majority of the NCLEX–RN items are designed to function at the cognitive level of application or higher. The questions are designed to force a candidate to show competency of problem-solving skills. These higher-level questions involve prioritizing patient care, making patient assignments, handling complex patient loads, and delegation of nursing tasks. Since 2001, the NCLEX–RN has included items other than the traditional four-response multiple-choice items. These items are referred to as alternate format items, and include fill-in-the-blank, multiple response, hot spot items, prioritization, audio, and graphic questions. The purposes of these alternate items are to access higher order cognition and thinking and to mimic real life patient situations (NCSBN, 2015c).

Scoring System

As mentioned previously, the NCLEX–RN uses CAT, which adjusts the difficulty of the items based on the student's ability. The goal of the CAT is to determine a difficulty level of questions that the candidate is likely to have a 50/50 chance of answering correctly (NCSBN, 2015a). The candidate is subjected to a minimum of 60 actual questions and 15 trial questions. The trial questions do not count towards determining if a student passes the NCLEX–RN. These trial items are being used to

assess their difficulty, reliability, and validity. It takes between one year and 18 months for a trial item to be integrated into the NCLEX–RN pool of items. At the present time, all items are stand-alone items. The CAT turns off somewhere between 75 questions and 265 questions once it has been determined, with a 95% confidence interval, that a candidate’s performance is either above or below the passing standard.

NCLEX–RN—Validity and Reliability

In addition to all items being assessed for content validity during the trial phase, validation evidence is a continued focus of the NCSBN. Evidence-based research is used to determine the content validity of the items. The NCSBN uses a variety of websites, nursing guidelines, and textbooks to provide validation evidence for NCLEX–RN items. This allows the NCSBN to incorporate evidence-based practice into their validation process (NCSBN, 2015a).

The reliability of the NCLEX–RN examination is determined via a decision consistency statistic. This statistic is used to calculate the students “true” ability instead of an estimate of their ability. The goal of this statistic is to determine if the candidate’s “true” ability is above or below the passing standard of the NCLEX–RN (NCSBN, 2015a). Once this “true” ability is calculated the probability that each candidate would have repeated results over two administrations of the NCLEX–RN is calculated. The mean of this probability, over all candidates, is the estimated decision consistency of the NCLEX–RN examination (NCSBN, 2015a). The decision consistency statistic of the NCLEX–RN examination is normally between .87 and .92.

Common Research Themes With the NCLEX–RN

Scholars and nursing educators have used a range of statistical methods in an attempt to understand the variables that influence, and/or are predictive of, outcomes on the NCLEX–RN. Statistical methods found to be used in the review of the literature include: (a) Chi-square, (b) Fisher’s Exact Test, (c) Two-Way Analysis of Variance, (d) Discriminant Analysis, (e) Logistic Regression, (f) One-Way Analysis of Variance, and (g) Correlation (Campbell & Dickson, 1996; Crow, Handley, Morrison, & Shelton, 2004; Daley et al., 2003; Seldomridge & DiBartolo, 2004; Endres, 1997; Haas et al., 2004; Landry, Davis, Alameida, Prive, & Renwanz-Boyle, 2010; McGahee, Gramling, & Reid, 2010; Mills, Sampel, Pohlman, & Becker, 1992; Uyehara, Magnussen, Itano, & Zhang, 2007). According to Seldomridge and DiBartolo (2004), predicting outcomes on the NCLEX–RN is challenging due to the constantly changing blueprint of the examination, the addition of alternative format questions, and the continuously increasing difficulty of the NCLEX–RN. Educational and non-educational variables thought to predict the outcomes of the NCLEX–RN investigated by previous researchers are extensive (see Table 1).

Table 1

Predictors of Outcomes on the NCLEX–RN

Pre-Admission GPA	Medical-Surgical Nursing GPA	Nursing Cumulative GPA
Final Cumulative GPA	Comprehensive Predictor Testing	Age
Semester Required to Graduate	Prior Licensure as Vocational Nurse	Number of Failures received in Nursing Courses
Ethnicity and/or Race	Scores on the SAT	Scores on the ACT
Support Groups during Nursing Programs	Computed-Based Testing	Comprehensive Advisement and Development Program
Students at Risk	NCLEX Review Course	Individual Counseling
Tutoring Programs	Science GPA	Parental Education
Year of Graduation	Type of Program (Traditional or Accelerated)	Native or Transfer Student
Critical Thinking Scores	Primary Language	High School Rank
Watson-Glaser Critical Thinking Appraisal Scores	Specific Nursing Courses (i.e., Mental Health, Pharmacology, and Fundamentals)	Senior Nursing Course GPA

(Beeman & Waterhouse, 2001; Campbell & Dickson, 1996; Crow et al., 2004; Daley et al., 2003; Seldomridge & DiBartolo, 2004; Endres, DiBartolo & Seldomridge, 2004; Haas et al., 2004; Landry et al., 2010; McGahee et al., 2010; Mills et al., 1992; Uyehara et al., 2007).

According to Endres (1997), the statistically strongest predictors found in a review of the literature included: (a) post-admission cumulative college GPA, (b) nursing GPA, (c) comprehensive predictor testing, and (d) ACT or SAT scores. Beeman and Waterhouse (2001) found that the number of theory courses passed with a C+ or higher was the best predictor. This is supported by Barkley, Rhodes, and Dufour (1998) who

found that as the number C's in a nursing clinical or theory course increased, the student outcomes on the NCLEX–RN decreased. Clinical nursing courses are those courses that in addition to the didactic portion have a hands-on clinical experience. They also reported that nursing GPA and science GPA were the best cognitive predictors, whereas education of the parents and student age were the best demographic predictors. Landry and colleagues (2010) concluded through a review of the literature that academic factors (e.g., GPA) and race were the only variables found to be consistent predictors of NCLEX–RN outcomes.

Socioeconomic Status (SES)

Walpole (2003) suggested strongly that investigations should be numerous and methodical to facilitate the understanding of the “college experience and post-secondary outcomes of low SES students compared to high SES peers” (p. 47). Such investigations require a clear conceptual definition of SES, and a valid and reliable method to measure the construct. The Association for the Study of Higher Education (ASHE, 2007) confirms the difficulty of defining and measuring SES in research. A clear and concise conceptual definition is provided and common measures/indicators of SES are presented in the following section.

Defining SES

Socioeconomic status is a variable commonly used to predict success in higher education (ASHE, 2007; Oakes & Rossi, 2003; Sirin, 2005). However, the measurement of SES is a complex and daunting task. Sewell (1942) elaborated on these difficulties, which involved “social theory, logic, and statistical methods, as well as practical matters”

(p. 279). One of the major issues in measuring SES is defining the construct. Many researchers have attempted to measure SES without having a clear definition (Sackett et al., 2009; Sewell, 1942; White, 1982). Oakes and Rossi (2003) also recognized the lack of a “nominal” definition of SES, and the inherent difficulty of researching a social phenomenon that has varying interpretations.

While a consensus definition of socioeconomic status does not exist, the following themes are found in the literature: (a) physical or material possessions, (b) income or wealth, (c) involvement in the community or social status, (d) access to resources, and (e) power (Chapin, 1928; Mueller & Parcel, 1981; Oakes & Rossi, 2003; Sirin, 2005). The following definition addresses the majority of the abovementioned themes: “SES refers to the extent to which individuals, families, or groups have access (either realized or potential) to, or control over valued resources, including wealth, power and status” (Van Ewijk & Slegers, 2010, p. 138). This definition—as it is aligned with CAPSES, the conceptual framework, and addresses the common themes used to define SES—serves as the conceptual definition for this study.

Measuring SES

Forming a conceptual definition of SES is only the first step in measuring the construct. There is no consensus on a measure or common metric/indicator of SES (Mueller & Parcel, 1981; Oakes & Rossi, 2003; Shavers, 2007). Oakes and Rossi mentioned that “conceptualizing and measuring SES is among the more difficult and controversial subjects in social research” (p. 770). An extensive review of the current body of literature, failed to yield a universally accepted measure of SES in educational

research. Furthermore, there is debate in the literature if SES should be measured on an ordinal or continuous scale. The issues indicate that developing an all-encompassing metric may not be possible. An alternative to a metric that is seen routinely in the SES research is the use of substitutes (i.e., proxies). Oakes and Rossi (2003) found that univariate measures (i.e., single proxies) of SES such as income and education “compared well” to composite measures of SES. In the following sections, the common proxies for SES are discussed.

Proxies for SES

The debate of whether to use individual family measures, a combination of family measures, or a comprehensive societal measure to approximate SES was a common theme found in the literature. Researchers who chose to use a combination of family variables operationally define SES differently than researchers who use an individual family variable indicator or comprehensive societal proxies. The difficulty in operationally defining SES has led the ASHE (2007) to recommend using the term SES cautiously in research. ASHE recommends using economically and educationally challenged (EEC) as the preferred term as it combines aspects of the common variables that are used to define SES. As EEC has not gained traction in the literature, SES was used in the current investigation.

As just mentioned, a common way to measure SES according to the literature is with a single variable or a combination of family variables. Another way to measure SES is by using comprehensive societal indicators. Each of these is discussed in the next

section, as well as the benefits and pitfalls of each approach. Based on the information presented, proxies for SES were selected for use in the current study.

Individual family variable proxies for SES. ASHE (2007), along with prominent researchers in the area, contend that three common and acceptable individual family variables are used to approximate SES. These proxies include family income, parental education, and parental occupation (Duncan, Featherman, & Duncan, 1972; Van Ewijk & Slegers, 2010; Mueller & Parcel, 1981; Oakes & Rossi, 2003; Shavers, 2007; Sirin, 2005; Strayhorn, 2009; White, 1982). Family variables used to measure SES according to Walpole (2003) included parental income, parental educational attainment, and parental occupation prestige.

Sirin (2005) supported using individual family variables as indicators of SES as it may not be appropriate to use a combination as they are not interchangeable and measure different components of SES. Parental income, for instance, is an indicator of both social and economic resources. Parental education is often the most stable indicator of SES as it is established early in life, and does not routinely change drastically. Additionally, parents' education often correlates highly with parental income, making multicollinearity (i.e., in multiple regression) a potential issue. The potential benefit of using the third indicator, parental occupation, is that it encompasses the social and economic status of a household, and to some degree addresses the social capital of the household.

Combination of family variable proxies for SES. Alternatively, some combination of the previously discussed family variables along with household belongings such as the number of books or computers are used to measure SES in

research (Coleman, 1988; Entwisle & Astone, 1994; Hollingshead, 1975; White, 1982). Sackett and colleagues (2009) found the same three, or a combination of these variables used in the research to approximate SES. The extent that the home environment (i.e., dwelling value and house condition) along with parents' attitude towards education should be considered when using proxies for SES research (Sirin, 2005; White, 1982).

ASHE (2007) stated, whereas most researchers use a composite variable that combines the formerly discussed family variables to measure SES, it is becoming more common for researchers to use only one indicator. White (1982) added that correlations computed from aggregated variables (i.e., a combination of variables) will often be higher than correlations computed by using individual variables in the analysis, which may result in issues with multicollinearity. Sirin (2005) indicated that recent research has transitioned from a paternal definition of SES to a more global definition of SES (i.e., including maternal characteristics). Prior to the 1980s, SES was often defined by the father's education and/or occupation. It has become more common in the U.S. for either or both parents to have some level of college or advanced education compared to the 1960s or 1970s.

Comprehensive societal proxies for SES. As mentioned previously, many researchers choose to use one or a combination of individual family measures (i.e., parental income, parental education, parental occupation, household belongings and/or environment) as proxies for SES. Other researchers believe that a comprehensive societal indicator is more appropriate. Examples of comprehensive societal measures

commonly used include SES of the student's school or SES of the student's neighborhood (i.e., school district or Zip Code).

One of the benefits of using school or neighborhood SES is that it goes beyond the student's home for an indicator of the true source of the students SES (Sirin, 2005). School SES is commonly determined by eligibility for free or reduced priced lunches. Low SES in this situation would be defined as receiving free or reduced lunches. One method to measure neighborhood SES is to determine the proportion of neighborhood residents at least 20 years of age who have not completed high school (Sirin, 2005). Societal measures of SES inherently consider the resources essential for academic achievement such as after-school programs, quality of libraries, and socialization with community members.

Comprehensive societal versus family variable proxies for SES. Clearly, there is no universally accepted proxy of SES in the education research literature. Sirin (2005), through a meta-analysis, found 79 correlations between SES and academic achievement through the use of six distinct indicators of SES. The most common substitute used were parental education ($n = 30$), followed by parental occupation ($n = 15$), parental income ($n = 14$), eligibility for free or reduced lunches ($n = 10$), neighborhood SES ($n = 6$), and home resources ($n = 4$). Sirin determined that "the type of SES component [proxy] significantly moderated the relation between SES and academic achievement" (p. 434). Furthermore the average effect size in the analysis of each indicator was found to be .51 for home resources, .33 for eligibility for free or reduced lunch programs, .30 for parental education, .28 for parental occupation, .29 for parental income, and .25 for neighborhood.

Sirin found no significant difference between the three most common family predictors—parental education, parental occupation, and parental income. All other pairwise comparisons were statistically significant ($p < .001$), with the exception of the comparison of occupation and neighborhood.

The use of family variables are more commonly seen in the literature as substitutes for SES when investigating the effects of socioeconomic status on student academic success. The use of societal measures as proxies for SES such as Zip Code or school SES, whereas not as common, may give additional insight into the SES-academic success relationship (Perry & McConney, 2010). Based on CAPSES, investigations that include family and societal measures of SES mostly likely will yield the deepest understanding of SES on student success. Considering this information and based on statistical issues such as multicollinearity when combining individual family variables, three individual family variable proxies and one comprehensive societal proxy were used. The individual family proxies include Pell Grant Eligibility, Student Race, and College Generation (first-generation or non first-generation). Zip Code was the only comprehensive societal proxy investigated.

SES and Education

Researchers have demonstrated that students with low socioeconomic status backgrounds have lower educational aspirations, persistence rates, and educational attainment than their peers from higher SES backgrounds prior to and during college (Strayhorn, 2009; Walpole, 2003). Strayhorn found that SES was the most influential factor impacting college aspirations. Research has demonstrated that SES and race act as

risk factors that place students at risk for attrition in higher education (Heisserer & Parette, 2002; O’Keeffe, 2013). Additionally, low SES students have a decreased probability of obtaining a bachelor’s degree, obtaining a degree from higher tier universities, or pursuing a graduate degree (Walpole, 2003).

Low SES students disproportionately enroll in community colleges and regional public institutions; whereas the higher SES students are more likely to enroll in the more prestigious private and well-known institutions. Although there are a multitude of factors that influence a student’s decision to attend a specific institution (i.e., access to social and academic capital, lack of access to information on the college selection process, financial consideration), SES is postulated as the number one factor (Hillman, 2013). These are not new findings as the Truman Commission in 1947 found that the nation was limiting access to higher education based on individual SES (Gilbert & Heller, 2013). There has been little progress to making equal access to higher education for all levels of SES a reality.

The above findings are elucidated in one study using longitudinal data that examined income, SES, and graduate school attendance for students of high and low SES families at different schools in terms of race and SES (Walpole, 2003). Special attention was paid to these students’ investment and conversion of cultural, social, economic, and academic capital. Investigation of these latent variables occurred through measurement of students contact with faculty, and time spent working, studying, volunteering, and involvement with co-curricular activities (i.e., student groups and/or intercollegiate athletics). Additionally, nine years of post-graduation data were collected on income,

degree attainment, educational aspirations, and graduate school attendance. The results indicated that the lower SES students were more likely to have decreased GPAs, and therefore were perceived to have decreased regard for academic capital when compared to their higher SES counterparts. The lower SES students, however, did appear to value economic capital more, as demonstrated by the increased number of hours worked during college compared to the higher SES students. As Walpole noted, this makes logical sense as higher SES students are more likely to be employed for knowledge gain or cultural capital than for financial necessity.

Higher SES students were found to average a higher level of income, graduate school attendance, and educational attainment compared to their lower SES peers.

Walpole (2003) demonstrated that “overall, socioeconomic status is a powerful predictor of graduate school attendance” (p. 58). She also found that being African American or female along with high SAT verbal and math scores significantly increased the probability of attending graduate school. The SAT verbal and math in conjunction with being female was not significant when accounting for GPA. Finally, it was found that when SES and ability were statistically controlled, African Americans had an increased probability of achieving a baccalaureate degree compared to Caucasians.

Measures of Achievement and the Moderation Effect

The manner in which researchers have measured SES has had a direct influence on the strength of the relationship between SES and test scores (Van Ewijk & Slegers, 2010; White, 1982). This influence has also occurred when investigating the effect of SES on overall academic achievement (White, 1982). Sirin (2005), in his meta-analysis,

found that the average effect size was .29 for the correlation between SES and academic performance. The author noted, “The choice of academic achievement measure was a significant moderator of the correlation between SES and academic achievement” (p. 435). Math achievement resulted in the strongest correlation between academic achievement and SES (.35), followed by verbal achievement (.32), science achievement (.27), and general achievement (.22).

Student Characteristics and the Moderation Effect

Sirin (2005) also investigated whether student characteristics (e.g., grade level, race, school location) moderated the relationship between socioeconomic status and academic achievement. Results demonstrated that a student’s grade/age was a significant moderator of the correlation between SES and academic achievement. The findings suggest from Kindergarten through middle school that the effect size between SES and academic achievement increases. Confounding the results was that the effect size for high school students (.26) dropped comparatively to middle school (.31) and elementary school (.27). Whereas Sirin did not attempt to explain these confounding results, one probable explanation is the shift that occurs in influence from family to peers as students move from middle school to high school (Larson, Richards, Moneta, Holmbeck, & Duckett, 1996).

Race has also been examined as a potential moderator of the relationship between SES and academic achievement. The mean effect size (i.e., correlation) between SES and academic achievement for Caucasian students (.27) was significantly larger than the mean effect size for minority students (.17). The association between SES and academic

achievement diminished as the percentage of minorities increased (Sirin, 2005). These findings suggest that race, especially minority status, may act as an indicator of SES.

School location (i.e., being from an urban, suburban, or rural school) was the final student characteristic that Sirin (2005) investigated for a moderation effect in the correlation between SES and academic achievement. Being from a suburban school resulted in the greatest moderation effect between SES and academic achievement (i.e., .28). Being from a rural school had the smallest effect size (.17). The dissimilarity between the suburban and rural effect sizes was statistical significant. There was no statistical difference found between students attending an urban school versus suburban schools or rural schools. These findings further support the appropriateness of race or zip code as an appropriate measure of SES.

Sirin (2005) suggested that researchers should consider four distinct yet important factors when measuring SES. These include: (a) unit of analysis, (b) level of SES measurement, (c) range restriction of SES, and (d) the source of SES data. The unit of analysis is a perplexing issue, and one that is discussed later in this chapter. Restriction of range should be avoided whenever possible as it results in a decreased effect size. Research suggests that information regarding SES should be collected from parents, as they are a more reliable source in reporting their own SES. Furthermore, it is believed that lower-achieving students and students from single parent families may overestimate their family's SES decreasing the correlation between SES and academic achievement (Ensminger et al., 2000). In the current study, when feasible, restriction of range was

avoided; however, the source of SES information in the existing data is not known, as the family member that completed the FASFA is not recorded.

Proxies in the Current Study

As mentioned earlier, the following four variables were used to approximate SES: (a) Pell Grant Eligibility, (b) Student Race, (c) College Generation (first-generation or non first-generation), and (d) Zip Code. These variables are found commonly in the SES literature, and are aligned with the three major “capitals” of CAPSES. Pell Grant Eligibility served as the estimate of material capital. Student Race and College Generation were to serve as an estimate of human capital. However, Student Race in these data was not suitable for inferential statistics. Finally, College Generation and Zip Code acted as the estimates of social capital. A more in-depth explanation of each of these indicators along with the research questions are in the following sections.

Pell Grant eligibility. The Free Application for Federal Student Aid (FAFSA) is used to determine a family’s financial standing (i.e., estimated family contribution). Financial aid administrators calculate the difference between students’s cost to attend a university and their estimated family contribution, in order to determine their eligibility for federal student financial assistance including Pell Grants (Federal Student Aid, 2015). Estimated family contribution is a measure of how much a student and his or her family can be expected to contribute to higher education for a specific year. The formula to calculate estimated family contribution differs depending on whether a student is a dependent, independent without dependents other than a spouse, or independent with dependents other than a spouse. Other variables used in the formula include total family

income and benefits, tax-filing status, the number of people in the student's family, the number of family members in college, and certain family assets. The formula recognizes that only a portion of a family's income and assets may be considered available for educationally-related expenses. The range of estimated family contribution is zero to 99,999.

The student's estimated family contribution is subtracted from the cost of attendance to determine whether federal student financial assistance is needed. Cost of attendance includes tuition, books, supplies, transportation, and room and board. For the 2014–2015 award year, eligibility for a Pell Grant required an estimated family contribution of less than \$5,158. Pell Grant amounts for the 2014–2015 award year ranged from \$602 to \$5,073 (Federal Student Aid, 2015).

It was found in the literature that estimated family income is either left untransformed as a continuous variable, or separated into categories. Paulsen and St. John (2002) used quartiles to define family income in their research to determine students' college choice and persistence. Low income was defined as a family income of less than \$11,000; lower-middle family income consisted of family incomes between \$11,000 and \$30,000; middle income entailed family incomes between \$30,000 and \$60,000; family income over \$60,000 was labeled high-income. Other researchers have also used quartiles to define family income (Teranishi, Ceja, Antonio, Allen, & McDonough, 2004) or even quintiles to group participants with similar SESs together (Walpole, 2003). When possible, continuous variables should be left in their original form, as categorization results in loss of power (Rhemtulla, Brosseau-Liard, & Savalei,

2012). The data available did not include estimated family contribution. However, Pell Grant Eligibility was available. Pell Grant Eligibility was coded as a dichotomous variable.

Pell Grant Eligibility was selected as one measurement alternative for SES as eligibility is based on family income. As mentioned earlier, family income is commonly used as a proxy for SES in educational research. However, family income was not collected for this sample. Estimated family contribution is calculated from a family's income and Pell Grant Eligibility is determined based on the estimated family contribution. As with all the proxies for SES in the current study, Pell Grant Eligibility was examined as one indicator of SES in a mediated model, a moderator model, and in moderated mediation model. The goal of the first research question (i.e., mediation model) was to determine if Pell Grant Eligibility, as an indicator of SES, influences the relationship between SES, ACT, and NCLEX–RN. The goal of the second research question (i.e., moderated model) was to build on the first research question, and determine when Pell Grant Eligibility as a proxy for SES influences the relationship between the ACT and the NCLEX–RN.

Student race. African-Americans, Latinos, and Native Americans are highly underrepresented proportionally in the health care professions, including nursing (Grumbach & Mendoza, 2008). Endres (1997) found no significant differences between the success rates on the NCLEX–RN between African-Americans and Caucasians born foreign to the U.S. (i.e., immigrants). African-American graduates who were successful on the NCLEX–RN tended to require significantly more semesters to complete a nursing

program compared to both foreign-born and Caucasian graduates. Daley et al. (2003) determined that race was a statistically significant predictor of outcomes on the NCLEX–RN. They found that 33% of non-Caucasian students were unsuccessful on the NCLEX–RN, compared to just 4% of the Caucasian students.

Racial minorities represent a higher proportion of lower SES when compared to the general college population. Furthermore, these diverse minority students are more likely to be first-generation college students (Pieterse, Carter, Evans, & Walter, 2010). SES and race, in the literature, have been found to be risk factors for attrition from higher education (Gamez-Vargas & Oliva, 2013; Heisserer & Parette, 2002; O’Keeffe, 2013). Latino students, who often are first-generation college students, many times have limited resources for navigating the higher education arena.

Minority racial status is commonly found in the literature to negatively contribute to high school and college graduation (Clark et al., 2013; Labovitz, 1975). Labovitz found the relationship between race (i.e., ethnic group) and college attendance to be high, and that race (i.e., ethnic group) was highly related to SES. Race was also found to be correlated to both the student’s neighborhood and school SES. While controlling for GPA, Labovitz determined that a decreased proportion of African-Americans (24.1%) and Mexican-Americans (19.2%) attended a four-year college when compared to Asians (57.6%) and Caucasians (53.7%). Approximately 68% of African-American participants of Labovitz’s study lived in the low SES neighborhoods. Consistent with Labovitz’s (1975) findings, more recent research in 2010 noted

The percentages of children who were living in poverty were higher for African Americans (34 percent), American Indians/Alaska Natives (33 percent), Hispanics (27 percent), and Native Hawaiians or Other Pacific Islanders (26 percent), than for children of two or more races (18 percent), Asians (11 percent) and Caucasians (10 percent). (National Center for Education Statistics, 2010, p. 5)

In 2008, 72% of recent high school graduates who were Caucasian enrolled in higher education within one year of graduation. In 1970, only 50% of recent high school graduates who were Caucasian enrolled in higher education within one year of graduation. Comparatively, in roughly the same time frame, the recent high school graduates who were African-American and Hispanic who enrolled in higher education within one year of graduation increased from 44% to 65% and 50% to 62%, respectively (National Center for Education Statistics, 2010).

To further support the link between race and SES in higher education, the National Center for Education Statistics (2010) found that in 2008, 92% of African-American students were eligible for financial aid and were rewarded the largest average amount per person (i.e., \$13,500). Similar findings were noted in primary education. In 2009, 48% of public school fourth graders were eligible for free or reduced-price lunches. A larger proportion of minority students were the ones who were eligible for these free or reduced price lunches, including 77% of Hispanics, 74% of African-Americans, 68% of American Indian/Alaska Natives, and 34% of Asian/Pacific Islanders, compared to 29% of Caucasian fourth graders.

Southeast Asian-Americans (SEAAs) represent a disproportionately lower number of people with baccalaureate degrees compared to the national average of 30%. These SEAAs include Vietnamese with a baccalaureate degree rate of 26%, Hmong with a baccalaureate degree rate of 14%, Cambodian with a baccalaureate degree rate of 13%, and Laotian with a baccalaureate degree rate of 12%. The ramification for these ethnic minorities related to this lower collegiate degree attainment includes: lower lifetime earnings, higher poverty rates, lower taxable revenues, and higher rates of incarceration (Museus, 2013). For these ethnic groups, one of the major reasons for the lowered rates of baccalaureate degree attainment is SES. The mean income in 2013 of Vietnamese was \$26,532, of Hmong was \$19,053, of Cambodian was \$20,737, and of Laotian was \$22,111. These are all considerably lower than the national mean of \$28,452 in 2013. Furthermore, many of these Southeast Asian-Americans live in low SES communities that commonly lack the primary and secondary educational systems and resources to prepare them for higher education (Museus, 2013).

Race was selected as another variable representative of SES. One of this study's foci, as with all the proxies for SES, was to investigate the performance of Student Race as an indicator of SES in a mediated model, a moderator model, and a moderated mediated model. The goal of the first research question (i.e., mediated model) was to determine whether race, as a substitute for SES, influences the relationship between SES, ACT, and NCLEX–RN. The goal of the second research question (i.e., moderator model) was to build on the first research question, and determine when race (i.e., African-American, Caucasian, Asian, etc.) as a proxy for SES influences the relationship between

ACT and NCLEX–RN. However, as noted above, and discussed more in future chapters, Student Race in these data was not suitable for inferential statistics.

College generation. Students are commonly asked a version of the following question during the application process for admission to colleges and universities in the United States: Are you a first-generation college student? (NOTE: You are a first-generation college student if neither of your parents [guardians] completed a four-year college degree). You are a first-generation college student if you live with only one parent or guardian and that person has not finished a four-year college degree.”

According to Stuber (2011), first-generation students comprise approximately 34% of the university freshman population with nearly one quarter of them not returning for their second year.

Students from families with low incomes, whose parents did not attend college, or whose parents have low-paying occupations, tend to be less successful in enrolling and graduating from college (ASHE, 2007). According to the ASHE, many researchers are using first-generation student status as a measure of SES; however, there is not a consistent definition of what constitutes being a first-generation student. Some researchers define first-generation students as those students with parents with no college experience, whereas other researchers define first-generation students as those with parents without a baccalaureate degree.

Other researchers go beyond using parental education as a dichotomous proxy for SES. For example, Dennis, Phinney, and Chuateco (2005) used three categories to define parental education, and subsequently the appropriate SES label. They grouped students

into low, medium, and high SES based on parental education. Low SES was assigned to students with parents without a high school diploma and unskilled occupations. Medium SES was assigned to students with parents with a high school diploma, no college experience, but with skilled occupations. High SES was assigned to students who had parents with at least some college experience, but no parents with a college diploma.

Soria and Stebleton (2012) investigated the difference in academic engagement and retention between first-generation and non first-generation students. First-generation students were defined by Soria and Stebleton and others (e.g., Choy, 2001; Pike & Kuh, 2005) as those students who come from non-college educated families (i.e., neither of their parents earned a baccalaureate degree). They found that first-generation students have lower academic engagement and retention compared to non first-generation students. The research completed by Soria and Stebleton and others (e.g., McCarron & Inkelas, 2006) found that first-generation students tended to be minority students, from the working class, and of low-income families. For the sake of their research, minority students were defined as Indian (American or Alaskan native), African-American, Asian, or Hispanic.

Ishitani (2006) also found that first-generation students were less likely to persist and graduate from college when compared to students of college-educated parents. Furthermore, first-generation students lack the social capital for making informed academic decisions when compared to non first-generation students. This may result in first-generation students having poorer academic outcome related to them being less likely to form or participate in study groups, interact with educators, seek support from

staff, and not participate in extra-curricular activities (Engle & Tinto, 2008; Yazedjian, Purswell, Toews, & Sevin, 2008).

Jenkins, Belanger, Connally, Boals, and Durón (2013) found that first-generation students faced challenging transitions into college life, regardless of SES. Jenkins and colleagues and other researchers (e.g., Collier & Morgan, 2008) defined first-generation students as students with no parents with a baccalaureate degree. First-generation students had less social support from family and friends, decreased satisfaction with life, and more depressive tendencies than non first-generation participants. The researchers also found a gender interaction with generation: with first-generation women having more difficulties than first-generation men. First-generation students were noted to have less family support, less financial stability, and increased ignorance about higher education expectations (Pascarella, Pierson, Wolniak, & Terenzini, 2004).

First-generation students are more often from low SES families and/or ethnic minority families. Additionally, these students may have difficulty forming relationships or bonds with non first-generation students, resulting in an SES-homogenous support system. First-generation students also have increased attrition rates in higher education (Collier & Morgan, 2008). One of the major hypothesized factors that leads to first-generation student attrition is their inability to acclimate to the social norms of college life. Non first-generation students have more resources, including college-experienced parents to help them better acclimate to higher education (Wolf-Wendel, Ward, & Kinzie, 2009). Gamez-Vargas and Oliva (2013) found that low SES Latino first-generation students had limited guidance from the primary adults in their families about higher

education. Additionally, they found that cost associated with attending an institution of higher education was a primary concern for their low SES Latino parents.

Lightweis (2014) investigated the success of Caucasian working-class first-generation college students. First-generation was defined as having parents who do not possess a baccalaureate degree. Working class was defined as parental occupations that required minimal skill, had lower pay, and did not require a college degree. According to Lightweis, Caucasian working-class students fall between the tools implemented by universities to help minority or low SES students. Some of the challenges of Caucasian first-generation students included a potential need to commute, financial hardship, and an inability to socialize related to parental guidance.

As mentioned previously, parental income is commonly used as a proxy for SES in research. Additionally, parental income is often a variable of interest in research about SES or students, with a variety of ways to measure the construct. For purposes of this research study, parental education was treated as a dichotomous variable with first-generation students in one category and non first-generation students in the other. First-generation students are defined as students whose parents (or guardians) have not completed a four-year college degree. Additionally, students are considered first-generation if they live with only one parent or guardian, and that person has not finished a four-year college degree.

One of this study's foci, as with all the proxies for SES, is to investigate students' College Generation as another alternative for SES in a mediated model, a moderator model, and a moderated mediated model. The goal of the first research question (i.e.,

mediated model) was to determine whether College Generation, as a substitute for SES, influences the relationship between SES, ACT, and NCLEX–RN. The goal of the second research question (i.e., moderator model) was to build on the first research question, and determine when does College Generation (i.e., first-generation vs. non first-generation) as a proxy for SES influence the relationship between ACT and NCLEX–RN.

Zip Code. Labovitz (1975) contended that school SES or neighborhood SES, in conjunction with an individual-level SES attribute, are statistically significant factors influencing educational behavior and outcomes. Labovitz used the median income of the census tract in which the participants in his study resided to determine neighborhood SES. He labeled the neighborhoods' SES as low, medium, or high. Race (i.e., ethnic group) was found to be correlated to both neighborhood and school SES. Socioeconomic status is posited as directly and indirectly influencing students' academic performance. Sirin (2005) noted that SES indirectly influences students' academic performance. Neighborhood location, for instance, is often correlated with parental income and education.

Strayhorn (2009) investigated the effect of SES on educational aspirations of African-American males based on "Urbanicity" (i.e., being from an urban, suburban, or rural high school). He found that there is a statistically significant difference between geographical locations on African-American males' aspirations to attend college. Suburban participants were found to have the greatest aspirations to attend college, which was statistically different than urban and rural participants (i.e., rural had the lowest). In 2008, Caucasian students were found mostly in non-urban areas (i.e., not in cities and

towns). African-American, Hispanic, and Asian/Pacific Islander students were concentrated in cities and suburban areas (National Center for Education Statistics, 2010). Strayhorn's findings suggest that even within the same race, SES remains a significant variable influencing higher education aspirations.

Martens and colleagues (2014) investigated the influence of living in public housing on students' educational outcomes. Educational outcomes were measured by grade nine and high school completion. It was found that students living in public housing had significantly lower educational outcomes. Interestingly, the location of the public housing is also influential to students' academic success. Students in public housing from wealthier neighborhoods (i.e., high mean neighborhood SES) had better educational outcomes when compared to students living in public housing from poorer neighborhoods (i.e., low mean neighborhood SES). Leventhal and Dupéré (2011) argued that neighborhood SES has an impact on educational achievement. Adolescents living in higher SES neighborhoods have increased educational achievement compared to their low SES neighborhood counterparts. Additionally, Burdick-Will and colleagues (2011) found a significant increase in mathematics and verbal skills when families were able to relocate to a higher SES area or neighborhood.

Zip Code was selected as an indicator of SES and is a comprehensive societal proxy. This variable is the only one that encompasses both family-specific SES and community SES. As a focus of the current study, student Zip Code was examined as an indicator of SES in a mediated model, a moderator model, and a moderated mediated model. The goal of the first research question involving Zip Code (i.e., mediated model)

was to determine whether Zip Code, as a substitute for SES, influences the relationship between SES, ACT, and NCLEX–RN. The goal of the second research question (i.e., moderator model) was to build on the first research question, and determine when does Zip Code (i.e., urban, suburban, or rural) as a proxy for SES influence the relationship between ACT and NCLEX–RN.

The ACT College Readiness Assessment

Now that an understanding of SES, its proxies, and the NCLEX–RN has occurred, the third variable of interest, the ACT, is discussed. It has been demonstrated over time that SAT and ACT scores have a high correlation with general cognitive ability (Frey & Detterman, 2004; Koenig, Frey, & Detterman, 2008; Thorndike, 1949). The ACT is a variable commonly found to be predictive of NCLEX–RN pass rates. As mentioned earlier, the National Council of State Boards of Nursing (NCSBN) uses the ACT score in predictive validity studies of the NCLEX–RN. Beeman and Waterhouse (2001) found that SAT math scores were significantly correlated with NCLEX–RN outcomes; however, the SAT verbal was not. Daley et al. (2003) found ACT scores to be a statistically significant predictor of outcomes on the NCLEX–RN. The higher the ACT score of a student, the more likely they are to be successful, as a first time test taker, on the NCLEX–RN.

Some researchers claim that higher education admission tests such as the ACT and SAT are inherently measures of a student's SES (Kohn, 2001; Zwick & Greif Green, 2007). Whereas others have claimed that when controlling for SES, the predictive power of these admissions tests on students' freshman GPA is not statistically or practically

significant (Biernat, 2003; Crosby et al., 2003). More recently, however, researchers have found these claims to be in error. The correlation between these admission tests and higher education GPA was only minimally impacted when controlling for SES. Sackett and colleagues (2009) investigated, through a collaboration of 41 colleges and a sample size of 155,191 students, whether the relationship between SES and higher education grades was independent of SES and ACT/SAT scores. Through controlling SES, they found that the correlation between ACT/SAT and higher education grades only dropped from $r = .47$ to $r = .44$. These findings contradict the notion that ACT/SAT scores are simply measures of a student's SES (Sackett et al., 2009).

The alternative hypothesis tested by Sackett and colleagues (2009) was that SES influences ACT/SAT scores, and then consequently impacts higher education grades. In other words, they tested the SES influence on higher education grades considering the mediating impact of ACT/SAT scores. They claimed that the correlation between SES and higher education grade was suggestive of a model with SES influencing ACT/SAT scores, which in turn are predictive of higher education grades. It was found that SES's correlation with post-secondary grades was near zero outside of the SES-ACT/SAT-grade relationships (Sackett et al., 2009).

As the number of minorities enrolling in institutions of higher education rises, so does the number of minority students who take the SAT/ACT. For instance, from 1998 to 2008 the number of Hispanics increased from 6% of ACT test-takers to 9% of test-takers. Similarly, during the same time frame, Asian test-takers increased from 9% to 13% of SAT test-takers. This trend is also true for African-American students (National

Center for Education Statistics, 2010). These statistics further support the need for this study and similar studies. As the number of low SES students and diverse minorities taking admission tests, enrolling in higher education, and sitting for the NCLEX–RN increases, an understanding of the variables that may directly or indirectly influence their success is essential for nursing programs, universities, and nursing education research.

Covariates

The variables discussed in this section are literature-based indicators that are predictive of outcomes on the NCLEX–RN. The influence of these variables was included in the current study to allow for a more accurate assessment of the relationship between the three main variables: (a) NCLEX–RN outcomes, (b) SES, and (c) ACT scores. These variables include: (a) Pre-Admission GPA, (b) College Science GPA, (c) Final College GPA, (d) Age, (e) Gender, and (f) Nursing Program Type.

Pre-Admission GPA

Seldomridge and DiBartolo (2004) found that pre-admission GPA had a statistically significant correlation with the NCLEX–RN. Daley et al. (2003), researching the same topic, found similar results—a higher GPA resulted in a higher likelihood of being successful on the NCLEX–RN. Other studies have demonstrated that academic preparation and/or previous academic success, especially in math and science, is a significant predictor of future academic success and higher education aspirations in African-American high school men (Strayhorn, 2009).

College Science GPA

Researchers have found that, in general, a student's college science GPA is a statistically significant predictor of outcomes on the NCLEX–RN (Simon, McGinniss, & Krauss, 2013). Beeman and Waterhouse (2001) found Biology I and II, along with Physiology and Pathophysiology I and II, to be significant predictors of the NCLEX–RN. Similarly, Seldomridge and DiBartolo (2004) found that a student's grade in pathophysiology was a significant predictor of outcomes on the NCLEX–RN. This also includes the areas of anatomy and pathophysiology, as GPAs in these subjects were significant predictors of outcomes on the NCLEX–RN (i.e., higher grades indicated an increased likelihood of outcomes on the NCLEX–RN; Daley et al., 2003).

Final College GPA

Researchers have found that a student's clinical nursing course GPA is a statistically significant predictor of outcomes on the NCLEX–RN (Simon, McGinniss, & Krauss, 2013). Endres (1997) found that students who achieved a D or an F in a nursing course were more likely to be unsuccessful on the NCLEX–RN. Conversely, the results also indicated that the students who were successful on the NCLEX–RN had significantly higher GPAs in their nursing courses. As discussed previously (i.e., in Table 1) other predictors of the NCLEX–RN include C+ and lower grades earned in nursing theory courses, GPA in the prerequisites, junior and senior year, and cumulative GPA in nursing (Beeman & Waterhouse, 2001; Daley et al., 2003; Landry et al., 2010; Seldomridge & DiBartolo, 2004).

Age

In general, research has shown that older learners tend to be more motivated and self-directed compared to younger counterparts (Leder & Forgasz, 2004; Murphy & Roopchand, 2003; O'Shea, 2003). Specific to the NCLEX–RN, Simon et al. (2013) found that age should be accounted for when determining significant predictors of the outcomes on the test. Similar to the general research, in nursing, older students were more likely to pass the NCLEX–RN (Daley et al., 2003; Harris, 2006). Conversely, other researchers have found that age is not a significant predictor of NCLEX–RN outcomes (Beeman & Waterhouse, 2001; Endres, 1997).

Sirin (2005) discovered mixed results on the influence of grade level, or age on the relationship between SES and academic achievement. According to some research, grade level or age acts as a moderator between the influence of SES and academic achievement; however, other researchers argue that influence of SES on academic achievement does not vary with age. The first argument is that as a student ages, the influence of age on the relationship between SES and academic achievement diminishes. Sirin (2005) hypothesized that this conditional effect results from either acclimation that occurs as a result of schools with varying SES students, or low SES students proportionally having a lower rate of academic retention. Longitudinal studies, however, contradict that grade level or age act as a moderator of the relationship between SES and academic success (Sirin).

Gender

The trend in the United States shows that women are pursuing higher education at a higher rate than men. Nearly 60% of new enrollments in major universities are female (Snyder & Dillow, 2012). The same is true related to graduation rates and pursuit of graduate degrees (i.e., the number of women has surpassed men; Aud et al., 2011). This trend of a gender gap is true regardless of SES or race (Goldin, Katz, & Kuziemko, 2006). Sewell and Shah (1967) found that SES for females had a greater influence on plans to attend college, college attendance, and college graduation than intelligence. The inverse was found to be true for males (i.e., intelligence was found to be a greater influence on plans to attend college, college attendance, and college graduation than SES). Beeman and Waterhouse (2001) did not find a statistically significant correlation between gender and the NCLEX–RN. Demonstrating the conflicting findings in this area, other researchers found that men failed the NCLEX–RN at a significantly higher rate than women (Haas et al., 2004).

Raque-Bogdan, Klingaman, Martin, and Lucas (2013) found that incoming female freshmen reported greater levels of perceived career barriers and higher levels of parental emotional support related to career choice when compared to men. There were no gender differences found on perceived educational barriers between men and women. There were also no differences found between ethnicities (i.e., African-American, Latino, Asian, and Caucasian) based on gender in the level of career-related parental support. Finally, there was no relationship between ethnic groups' perceptions of career or education barriers and gender.

This gender gap, of more females than males enrolling in higher education, is most prominent for African-Americans. In 2008, 64% of African-Americans enrolled in an institution of higher education were females. Furthermore, females are earning higher percentages of undergraduate degrees for each racial/ethnic group (The National Center for Education Statistics, 2010). Interestingly, compensation in the workforce for those with an undergraduate degree is drastically skewed toward men (i.e., men make more on average than females in the same job with the same degree). For example, the median income was \$71,000 for Caucasian males with a baccalaureate degree but only \$50,000 for Caucasian females with a baccalaureate degree. Similarly, the median income for African-American males with a baccalaureate degree was \$54,000 compared to \$45,000 for African-American females with a baccalaureate degree. This trend is present regardless of race (The National Center for Education Statistics, 2010).

Nursing Program Type

Over the last 10 years, and more so in the last five, there has been an emergence of Accelerated BSN programs. These programs are focused on students who have earned a baccalaureate degree previously, and who earn the Bachelor of Science in Nursing (BSN) as their second degree. Only one group of researchers has examined the difference in predictors for accelerated students compared to traditional students. Beeman and Waterhouse (2001) found that accelerated students were less likely to fail the NCLEX–RN. Landry et al. (2010) indicated that literature comparing the first-time pass rates on the NCLEX–RN between accelerated and traditional nursing programs is minimal at best.

Summary

Chapter 2 reviewed the current research on the NCLEX–RN, SES, the ACT, and other pertinent variables. In Chapter 3, the methodology provides details about the participants, measures, procedure, and data analysis for the current study.

CHAPTER III

METHODOLOGY

Purpose

This is a retrospective cross-sectional analysis that aims to examine a range of Socioeconomic Status (SES) indicators that are predictive of first time outcomes on the National Council Licensure Examination–Registered Nurse (NCLEX–RN). A hypothesized moderation effect of SES on the relationship between ACT College Readiness Assessment scores and NCLEX–RN outcomes is investigated. Additionally, a hypothesized mediation effect of ACT scores between the relationship of SES and NCLEX–RN outcomes is examined. After the hypothesized moderation and mediation effects are investigated, a conditional process analysis is used to explore the best-fitting model that include SES, ACT, NCLEX–RN, and six other covariates.

Conditional process analysis is a statistical technique used to examine if a relationship between three or more variables are of the moderated mediation type (Hayes, 2013). Both mediated and moderated effects were examined between the three key variables. Conditional process analysis is a form of path analysis that allows for investigation of complex mediation and moderation models. Thus, the statistical analyses that were produced provide evidence for *X*'s impact on *Y*, and can support *how* *X* exerts its effect on *Y* and *when* does *X* affect *Y* (i.e., and when it does not; condition of *X*; Hayes, 2013).

Context

SES has routinely, and appropriately, been used in numerous research studies as a strong predictor of higher education outcomes (Sewell, 1942). However, the measurement of SES is a common hurdle to its use in research. It is difficult to measure student SES directly, as some researchers have conceptualized SES as a latent variable defined by more than one observed variable (Sackett et al., 2009; Sewell, 1942; White, 1982). The intricacy in measuring SES often forces researchers to use proxies (i.e., substitutes, indicators, or measures of) for SES in their research. In the current research study, the indicators of SES include: (a) Pell Grant Eligibility, (b) Student Race, (c) College Generation, and (d) Home Zip Code. Moderated and mediated logistic regression, separately, were used to determine the nature of the relationship between these variables and ACT and NCLEX–RN. These proxies were then used to build a moderated mediation model of the relationship between the SES, ACT scores, first time NCLEX–RN outcomes, and six covariates.

The ACT was selected as the hypothesized mediator as it is a variable, along with the SAT, that is commonly found to be predictive of NCLEX–RN scores (i.e., passing/failing the NCLEX–RN; Daley et al., 2003). As a student's ACT score increases, he or she is more likely to have a positive outcome on the NCLEX–RN. Additionally, it has been demonstrated over time, that both SAT and ACT scores are correlated with general cognitive ability (Frey & Detterman, 2004; Koenig et al., 2008; Thorndike, 1949). Students with only SAT scores were not eligible for inclusion. Although ACT and the College Board have completed a concordance study that demonstrates the strong

positive relationship between the ACT and the SAT (ACT Inc., 2015), exact conversion is not possible.

Participants

Existing participant data from a large, public university in the Midwestern United States were analyzed. The use of the existing data was approved by the university's Institutional Review Board (IRB) to facilitate safe and ethical handling of the data. Data from all graduates (i.e., from all BSN programs) within the last five years was included. The two baccalaureate programs (i.e., BSN) offered at the university are a traditional four-year program and an accelerated 15-month program. Traditional graduates are former students who have achieved their first baccalaureate degree. Accelerated graduates have already achieved at least one previous baccalaureate degree. The university has a main campus and four regional campuses that offer at least one of these BSN programs. Graduates from the main campus along with the regional campuses are included in the analysis. To be considered for inclusion, participants must have had a complete data set for the key variables (i.e., NXLEX–RN, ACT Composite, and all 4 potential proxies for SES). The year-restricted range sample size was 1,176 and included participants from 29 states, with a large majority being from Ohio.

According to US Department of Health and Human Services (USDHHS, 2013), 89.9% of RNs are women. Approximately 61% of students at the large, public university are female (Research Planning & Institutional Effectiveness, 2015). As was hypothesized, the majority (i.e., 85.4%) of the participants in this study were female. The average age of RNs in the US is 46.6 years old, with 14.8% of nurses being 30 years of

age or younger (The United States [US] Nursing Workforce). The average age of students at the large, public university from 2010-2015 was 25.7 (Research Planning & Institutional Effectiveness). The age distribution in the existing data was positively skewed with many students around 24 years old. Approximately 10% of RNs self-identify as Black, 8.3% identify as Asian, 4.8% identify as Hispanic or Latino, 1.3% categorize themselves as two or more races, and .4% identify as American Indian or Alaskan Indian (USDHHS). Approximately 8% of undergraduate students at the large, public university in the current study self-identify as Black, 1.2% identify as Asian, 2.7% identify as Hispanic, 2.8% identify as multi-racial, 0.24% identify as American Indian or Alaskan, and 0.07% identify as Native Hawaiian/Pacific Island (Research Planning & Institutional Effectiveness). In the current study 5.7% of the participants self-identified as Black, Native American, Alaskan Native, or Hispanic; 1.2% self-identified as Asian, with a large majority (93.1%) self-identifying as Caucasian.

Procedure

In this section, the statistical procedures used are discussed. Preparation of the data, including data cleaning, data accuracy, missing data, and the handling of outliers are addressed. An introduction to logistic regression and its assumptions, along with the rationale for its use in this research study, are reviewed. Additionally, mediation and moderation and their accompanying models are discussed. Finally, conditional process analysis, as a method to fit the overall model to the data, is reviewed.

Data Cleaning

Accuracy of data. The existing data underwent a pre-analysis to ensure that it was suitable for multivariate analysis. First, the data were visually inspected for accuracy (i.e., correctness). Second, the data were examined using descriptive statistics. The variables were investigated to ensure that the range included only possible values. The means and standard deviations of the variables were also examined to ensure plausibility (i.e., no incorrectly coded data). For the categorical variables, cases were reviewed to make sure they correspond to the coded values for the categories.

Missing data. Following the above procedure, the data were assessed for missing or incomplete data. The amount of missing data is not as detrimental to the validity of the results as any patterns that may exist (Tabachnick & Fidell, 2013). With that said, approximately, 23% of the cases had missing data. As this number was well over the 5% threshold, it was considered substantial and required in depth investigation. The procedural steps that were followed are outlined in the following sentences. Random missing data are preferred to nonrandom missing data. Nonrandom missing data may influence the generalizability of the results. There are no universal guidelines for determining what constitutes a concerning amount of missing data (Mertler & Vannatta, 2005).

To determine if missing data were random or nonrandom in nature, variables with missing data were dummy coded into dichotomous variables. Cases where the data were available were coded 1 and cases with missing data were coded 0. An independent samples Welch *t*-test was used to determine if there was a significant mean difference

between the groups on the missing variables. Little's Missing Completely at Random (MCAR) Test (Little, 1988) was performed and it was determined the data were not Missing Completely at Random (Tabachnick & Fidell, 2013). Based on these findings, multiple imputation through the Missing Values add on in SPSS was performed.

Multiple imputation (MI) is a technique commonly used to analyze data with missing values (Sinharay, Stern, & Russell, 2001). Through the Missing Values Analysis add on accompanying SPSS Version 23, multiple data sets with varying values for the missing data were calculated. All the calculated data sets had the same non missing data as the original data set. Logistic regression was used with each data set and the results, through SPSS, were aggregated. This aggregated data set was used for the remainder of the analyses.

Outliers. Extreme values (i.e., outliers) are cases that fall outside the normal range of values on one or more variables. These outliers can cause a distortion (e.g., skewness) in the data set. The presence of an outlier can lead to an increased risk of committing a Type I or Type II error. Furthermore, outliers make the generalizability of the results minimal at best (Lomax & Hahs-Vaughn, 2012). The following three causes of outliers were investigated: (a) Data were reviewed to make sure there was not a transcription error, (b) Missing values were coded in SPSS to prevent them from being mistaken as valid data, and (c) Upon locating outliers, cases containing the outliers were considered for deletion, or the specific value was updated to decrease the influence the outlier has on distortion of the data.

Univariate and multivariate variables (i.e., both dichotomous and continuous) were screened for outliers. Dichotomous variables with a 90% to 10% split or more between categories were not used in any inferential analyses (Rummel, 1988; Tabachnick & Fidell, 2013). This was the case with Race. Univariate outliers are cases with extreme values on one variable, and multivariate outliers are cases with unusual combinations of scores on two or more variables (Tabachnick & Fidell, 2013). Univariate outliers were detected by standardizing the raw scores into z -scores. Since the sample size is greater than 100, any z -score that was greater than +3.29 or less than -3.29 was considered an outlier (Stevens, 2012). Furthermore, outliers were visually inspected with histograms, box plots, and normal probability plots.

All univariate outliers, in addition to the remainder of the raw data, were investigated for influential cases in the model (e.g., predicted values, group membership, influence, residuals). Once outliers, univariate and multivariate, were identified they were reviewed to determine if the analysis would include them “as is,” transformed, or with them removed. Transforming variables may decrease the interpretability of the results related to the new scale of measurement. Transforming variables helps to decrease the influence of outliers, as the scale is transformed to make the distribution more closely approximate the normal distribution (Osborne & Overbay, 2012). Transformation of variables was explored, but was not implemented in the final analysis data.

Logistic Regression

Logistic regression, from the family of multiple regression) was appropriate as it incorporates multiple input variables (i.e., IVs) to predict or explain the output variable (i.e., DV). Logistic regression is a form of multiple regression that is used when the outcome variable is categorical. The NCLEX–RN outcome in the current investigation is a dichotomous DV (i.e., pass or fail), and therefore Maximum Likelihood Logistic Regression was appropriate.

The assumptions that must be met for logistic regression include: (a) linearity, (b) independence, and (c) multicollinearity. If one or more of these assumptions are violated, the results of the analysis may be biased. These assumptions along with the methods proposed to investigate these assumptions are discussed in the following paragraphs. Additionally, possible resolutions to violations of the assumptions are proposed.

Linearity. The assumption in linearity in logistic regression assumes that there is a linear relationship between any continuous predictors and the logit of the outcome variable. The linearity assumption was checked by determining if the interaction term between the predictor and its natural log transformation was significant. The Box-Tidwell (1962) test was used to test the linearity assumption. The linearity assumption was not violated and therefore the interpretation of the regression coefficients remained meaningful.

Independence. The assumption of independence states that the errors in estimation are statistically independent. In other words, two data points are independent

if information about one gives no information about the other. This assumption was met, as these data do not contain repeated measures or other forms of dependent data.

Multicollinearity. If predictor variables are too highly correlated, this assumption may be violated. Multicollinearity was checked with tolerance and variance inflation (VIF) statistics, and the eigenvalues of the scaled and the un-centered cross-products matrix. A tolerance value that is less than .1 or a VIF value greater than 10 may indicate multicollinearity. In addition to the tolerance value and the VIF, the eigenvalues of the scaled and the un-centered cross-products matrix were investigated. Eigenvalues that are substantially larger than the others indicate that the un-centered cross-products matrix is ill conditioned, indicating that the regression parameters may be impacted by small changes in the predictors or the outcome. Stated differently, similar eigenvalues indicate that the model is likely to be unchanged by small variations in the measured variables. Multicollinearity was not found to be of concern in these data.

Mediation and Moderation

Mediation, according to Hayes (2013), is when “variation in X causes variation on one or more mediators M , which in turn causes variation in Y ” (p. 7). Mediation analysis allows for testing of direct and indirect effects of X on Y . Moderation between X and Y occurs when the magnitude of the casual effect is influenced by at least one additional variable (Hayes). The term moderation and interaction are used commensurately in quantitative research.

Mediation. Mediation assists in answering the question of how variable X influences Y . A direct effect occurs when X impacts Y without passing through another

variable. An indirect effect occurs when X impacts Y through another variable M , or the intervening variable(s).

Causal steps approach (Baron & Kenny, 1986). It is important to discuss the foundations of mediation analysis: *The Causal Steps Approach*. The causal steps approach is a historical quantitative method used to determine if a variable is functioning as mediator between X and Y (Baron & Kenny, 1986). This method is still taught to lay the foundation of mediation analysis (Hayes, 2013).

The first step in the casual steps approach is to reject the null hypothesis that the total effect, c , in the relationship between X and Y is zero. If the first condition is met then the effect of X on M , a , is estimated through simple regression. Similar to the first step, a rejection of the null hypothesis is needed to support the relationship between the two variables, X and M , and to continue the process. The third step in the casual step method is to regress Y on X and M to determine if M affects Y while controlling for X , c' . Rejection of the null hypothesis leads to the comparison of direct effect of X , c' to the total effect c . If c' is closer to zero than c and c' is not found to be statistically significant, then M is said to account for the effect of X on Y (i.e., complete mediation). Inversely if c' is closer to zero than c but c' is statistically different than zero, then M partially mediates the effects of X on Y (i.e., partial mediation).

The casual steps method has four potential underlying methodological challenges (Hayes, 2013). First, the indirect effect is not assessed for statistical significance. Second, the power of the procedure used to determine if M is a mediator is diminished (i.e., increased likelihood of making a type II error), as it requires three hypothesis tests

(i.e., increased family wise error rate). Third, it is possible for X to effect Y through a mediator(s) even if the total effect cannot be proven to be different than zero (i.e., the first mediator is positive and the second mediator is negative). The final methodological concern of the causal steps method is the labeling of the indirect effect. In the causal steps method, a mediator is either a complete or partial mediator; there is no thought given to a moderated mediator relationship. For these reasons, mediation as discussed by Hayes and implored by PROCESS was used for this research study.

Simple mediated effect hypothesis. Figure 2 was used as the base model to address the relationship between SES and NCLEX–RN and the hypothesized mediator of ACT scores. ACT scores, as mentioned previously, is often considered one of the strongest if not the strongest predictor of NCLEX–RN.

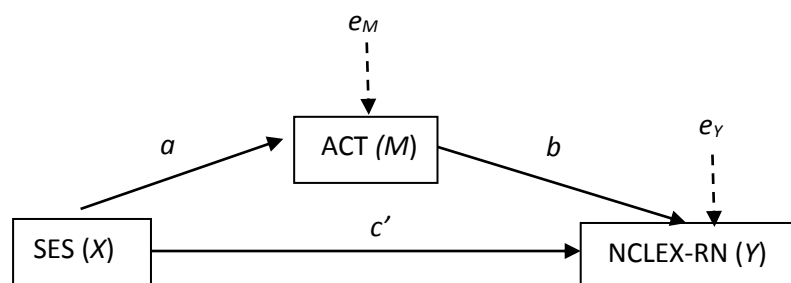


Figure 2. Statistical model with ACT as a mediator between SES and NCLEX–RN.

ACT and NCLEX–RN variables are both “consequent” in Figure 2 and therefore two linear models are required. A consequent variable is synonymous with an outcome variable or DV. An antecedent variable is the same as a predictor variable or IV. One variable can function as both a consequent and antecedent. The linear models for Figure 2 are:

$$M = i_1 + aX + e_M \quad (3.1)$$

$$Y = i_2 + c'X + bM + e_Y \quad (3.2)$$

$$Y = i_2 + b(i_1 + aX + e_M) + c'X + e_Y \quad (3.3)$$

Where i_1 and i_2 are regression intercepts, e_M and e_Y are errors in the estimation of M and Y , respectively, and a , b , and c' are the regression coefficients given to the antecedent variables in the model in the estimation of the consequents. The direct effect, c' , is the direct effect of X on Y . In Model 3.1, two cases that differ by one unit on X but are equal on M are estimated to differ by c' units on Y . In other words, the direct effect quantifies the estimated difference in Y , between two cases that differ by one unit on X independent of M 's influence on Y . In the Model 3.1, a quantifies how much two cases differ by one unit on X are estimated to differ on M . In the Model 3.2, two cases that differ by one unit on M but that are equal on X , are estimated to differ by b units on Y . The indirect effect of X on M is the product of a and b . The indirect effect reflects that two cases that differ by one unit on X are estimated to differ by ab units on Y as a result of the effect of X on M , which in turn, affects Y . The total effect, Model 3.3, represents the effect of X dependent and independent of M on Y . Model 3.3 represents a combination of Model 3.1 and 3.2 with the symbols retaining their meaning (i.e., have the same interpretation).

In the following sections, the specifics of the hypothesized mediated model are outlined. Discussion of confounding variables generally and then specifically to the hypothesized mediated model occurs. Additionally, the model equation was updated to

reflect the addition of the confounding variables to the mediated model. Finally, the methods of determining the total, direct, and indirect effects are reviewed.

Confounded mediated effect hypothesis. Variables that are thought to be confounding in nature can induce model specification even though they are unreliable. From a thorough literature review, potentially confounding variables in the mediation model include: (a) pre-admission GPA (C_1), (b) college science GPA (C_2), (c) final college GPA (C_3), (d) age (C_4), (e) gender (C_5), and (f) program type (C_6). Including these variables as predictors of NCLEX–RN outcomes (Y), as seen in Model 3.4 and Figure 3, statistically removes their influence from the association between SES (X), ACT (M), and NCLEX–RN (Y).

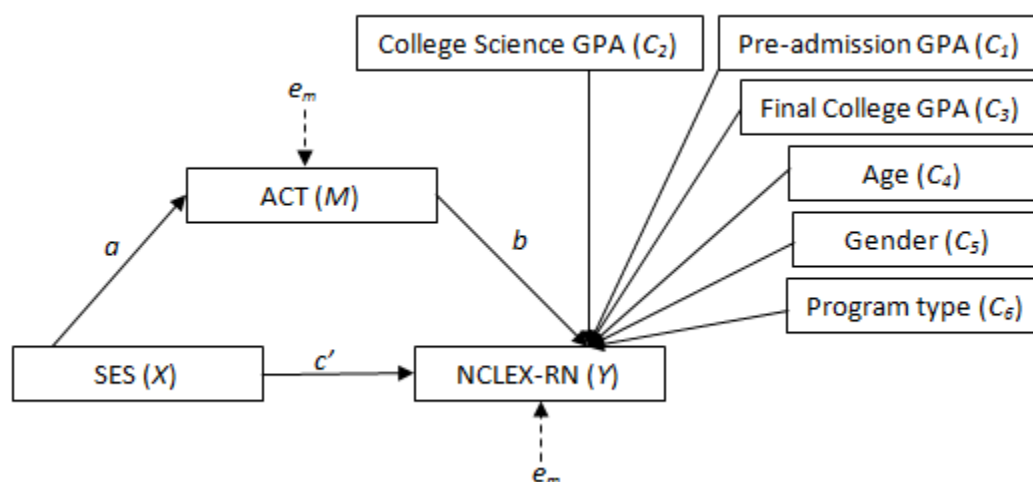


Figure 3. ACT as a mediator between SES and NCLEX–RN while controlling for (a) pre-admission GPA (C_1), (b) college science GPA (C_2), (c) final college GPA (C_3), (d) age (C_4), (e) gender (C_5), and (f) program type (C_6).

The models of M and Y including these covariates change from Equations 3.1 and 3.2 to:

$$M = i_1 + aX + e_M \quad (3.4)$$

$$Y = i_2 + c'X + bM + \sum_{i=1}^q giCi + e_Y \quad (3.5)$$

Where i_1 and i_2 are regression intercepts, e_M and e_Y are errors in the estimation of M and Y , respectively, and a , b , and c' are the regression coefficients given to the antecedent variables in the model in the estimation of the consequents. The changes, $\sum_{i=1}^q giCi$, reflect the addition and control of the q covariates to the model of Y . The estimates for a , b , and c' , are considered more reliable after inclusion of these statistical controls. In Model 3.5 c' is still the direct effect of X , ab remains the indirect effect of X on Y through M , and the total effect of X on Y is the sum of the direct and indirect effects, $c' + ab$. The total effect will be equal to c in a model of Y without M but including the q covariates:

$$Y = i_3 + cX + \sum_{i=1}^q giCi + e_Y \quad (3.6)$$

So c (i.e., $c = c' + ab$) quantifies how much two cases that differ by a unit on X are estimated to differ on Y holding M and C covariates constant. The indirect effect, ab , quantifies how much two cases that differ by one unit on X but are equal on all C covariates are estimated to differ on Y , as a result of the effect of X on M , which turn affects Y . Finally, the total effect of X , c , estimates how much two cases that differ by a unit on X are estimated to differ on Y , statistically controlling for C .

c' (direct effect). The direct effect is the influence X causes directly on Y . Inference of the direct effect of X on Y were tested using a null hypothesis about $\tau c'$ against the alternative hypothesis. Additionally, a 95% confidence interval for $\tau c'$ was calculated. Rejecting the null hypothesis indicates that the claim that $\tau c'$ is different from

zero is justified based on the data available. Therefore, supporting the claim that X is related to Y independent of the mediator variable M . If not, there is no evidence of an association between X and Y when the mechanism through M is explained. In other words, X does not affect Y independent of M 's effect on Y . If the 95% confidence interval for the direct effect includes zero, then zero cannot be confidently ruled out as a plausible value for the direct effect. A confidence interval that contains zero would result in the failure to reject the null hypothesis (i.e., there is no evidence of association between X and Y when accounting for the mechanism through M).

$ab = c - c'$ (indirect effect). The indirect effect is the effect that X causes on Y through M . The indirect effect quantifies how much two cases that differ by a unit on X are estimated to differ on Y as a result of X 's influence on M , which in turn influences Y . The indirect effect is relevant as to whether X 's effect on Y can be said to be transmitted through the mechanism represented by the $X \rightarrow M \rightarrow Y$ causal chain of events.

Inferences about the indirect effect of X on Y through M were made using bootstrap confidence intervals. Bootstrap confidence intervals are not limited to the normality issues of the normal theory approach (i.e., there is no assumption about the normality of the sampling distribution of ab ; Hayes, 2013). Bootstrapping in mediation analysis is used to calculate a representation of the sampling distribution of the indirect effect, which in turn is used to construct the confidence intervals for ab . The calculated bootstrap confidence intervals result in estimates that are considered more accurate than the normal theory approach, as it addresses the irregularity of the sampling distribution of ab . Bootstrapping was appropriate in this research study and analyses as the sample was

found to be representative of the population and the sample size was sufficient. Bootstrapping is not appropriate for very small samples as repetitive use of an outlier in the original sample can drastically affect the estimate of the indirect effect ab . Hayes did not give a specific sample size that is appropriate for bootstrapping. Bias corrected bootstrapping for inference about the indirect effect was used in the study. The construction of the bootstrap confidence intervals using the PROCESS software follows the six steps as outlined in Hayes.

$c = c' + ab$ (**total effect**). The total effect is the effect that X exerts on Y through both the direct and indirect pathways. The total effect was estimated by simply regressing Y on X . Inferences about the total effect of X on Y were also made using bias corrected bootstrap confidence intervals. The effects or regression coefficients (c , c' , and a) are sample specific iterations of their true values τC , $\tau C'$, and $\tau a\tau b$. They describe the association between the variables in the available data, limiting any inferences that can be made about generalizability.

The indirect and total effects with a dichotomous outcome variable are scaled differently, rendering discrepancies between the sum of the direct and indirect effect and the total effect. Therefore, the difference between the total and the direct effect of X on Y cannot be used as a substitute for the indirect effect. Additionally, this scaling effect prohibits the use of the difference between the total and direct effect from being used as a metric of effect size, such as the proportion of the effect that is mediated (Hayes, 2013). The regression coefficients were estimated using the Newton-Raphson iteration

algorithm, as the outcome variable (i.e., NCLEX- RN) is dichotomous. The number of iterations and the convergence criterion were 10,000 and .00000001, respectively.

Effect size in mediation analysis. In mediation analysis two cases that differ by one unit on X are estimated to differ by c' and ab units, through the direct and indirect processes, the effects are considered scale bound. The effect is reported in the metrics of X and Y and their sizes are determined by the units of measurement of X and Y . Many of the common measures of effect size are not appropriate for this research study. For instance, Kappa-Squared (k^2 ; Preacher & Kelley, 2011) and R^2_{med} (Fairchild, MacKinnon, Taborga, & Taylor, 2009) are not appropriate with covariates. The Partially Standardized Effect and Completely Standardized Effect are not appropriate with a dichotomous or categorical main predictor, as they communicate in standard deviation units that the direct and indirect effects are having on Y .

Hayes (2013) cautioned using the remaining two measures, the ratio of the indirect effect to the total effect (P_M), and the ratio of the indirect effect to the direct effect (R_M), as they require large samples to be considered stable. The recommended minimal sample size for R_M is 2000 and for P_M is 500 (MacKinnon, Warsi, & Dwyer, 1995). The sample size for this research study as mentioned earlier is 1,176 making P_M the only appropriate measure of effect size.

The following formulae is for the proportion of the total effect that is mediated:

$$P_M = \frac{ab}{c} = \frac{ab}{c' + ab} \quad (3.7)$$

The closer P_M is to one, the more of the effect of X on Y can be said to operate through M . Inversely, the closer P_M is to zero, the less of an effect of X on Y via the indirect process

through M is attributed. For P_M to yield a meaningful effect size, the total effect needs to be larger than the indirect effect and of the same sign (MacKinnon, Krull, & Lockwood, 2000).

Moderation. Mediation analysis answers the questions of how, whereas moderation analysis answers the questions of when. In other words moderation is used to determine whether the size and sign of the effect of X on Y depends on the influence of a moderator variable(s). Moderation and interaction are two terms that are often used interchangeably in quantitative analysis. The effect of X on some variable Y is moderated by M if its size, sign, or strength depends on or can be predicted by M . If these conditions are met, then M and X interact to influence Y .

Moderation is used when a researcher wants to determine the boundary condition for an association between two variables (Hayes, 2013). Boundary conditions are the circumstances for when an association exists, or the direction of cause is known. These conditions answer the “when” questions such as under what circumstances, or for which types or people does X exert its effect on Y . Moderation analysis is performed by testing the interaction between M and X in a model of Y . Testing an interaction occurs when a researcher quantifies and describes the bounded nature of the effect of X on Y at various values of the moderator (Hayes, 2013).

In the following sections, the specifics of the hypothesized moderated model are outlined. Discussion of covariates occurs. Additionally, the model equation is updated to reflect the addition of the covariates. Finally, nuances of moderation analysis such as

hierarchical data entry, visualization of moderation, and probing of interactions are reviewed.

Moderated effect hypothesis. Figure 4 addresses the relationship between ACT and NCLEX–RN and the hypothesized moderator SES. The proxies for SES, mentioned previously, were tested for a moderation effect. The goal of the moderated questions are two-fold: (a) To determine if SES is indeed a moderator of the relationship between ACT and NCLEX–RN, and (b) If SES is found to be a moderator, which of the proposed proxies best demonstrates this moderator effect.

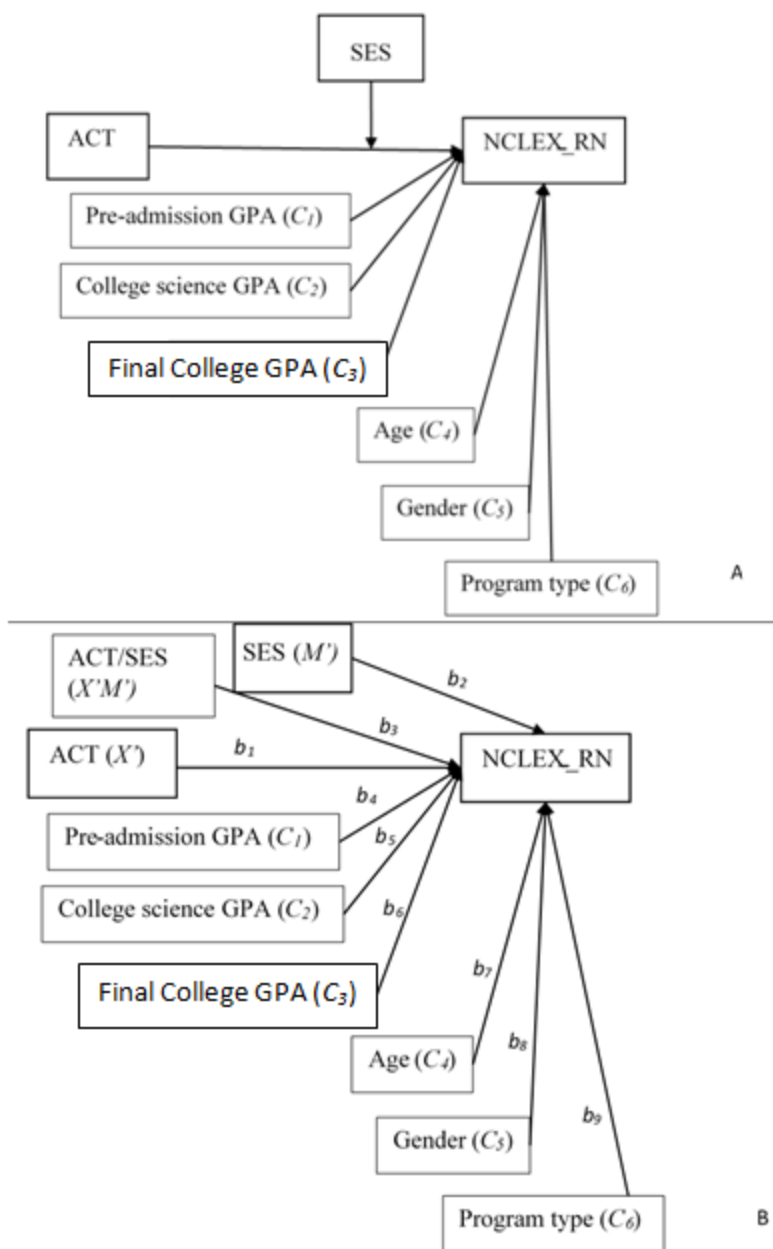


Figure 4. Moderation of the effect of SES between ACT and NCLEX–RN with covariates as a conceptual (*Panel A*) diagram and a statistical diagram (*Panel B*).

The moderation model diagrammed in Figure 4, can be expressed with the following equation:

$$Y = i_1 + b_1X + b_2M + b_3XM + b_4C_1 + b_5C_2 + b_6C_3 + b_7C_4 + b_8C_5 + b_9C_6 + e_y \quad (3.8)$$

Where b_3 estimates how much difference occurs in Y between two cases which differ by a unit on X as M changes by one unit. The conditional effect of X on Y when $M = 0$ is b_1 .

In other words b_1 quantifies how much two cases that differ by one unit on X but with $M = 0$ are estimated to differ on Y . The conditional effect of M on Y when $X = 0$, is b_2 . In other words, b_2 quantifies how much two cases that differ by one unit on M are estimated to differ on Y conditioned on $X = 0$. The error in the model of Y is represented e_y represents. The remainder of the equation represents statistical control of the covariates.

Hierarchical data entry. Simultaneous entry occurs when the model of Y (NCLEX–RN) is built with M (SES), X (ACT), the interaction effect (i.e., the product of X and M), and the covariates (i.e., pre-admission GPA (C_1), college science GPA (C_2), final college GPA (C_3), age (C_4), gender (C_5), and program type (C_6) are entered at the same time. The concern with simultaneous entry is it is not possible to determine if the model fits the data better with or without the moderation effect. Hierarchical entry occurs when the interaction effect (i.e., the product of X and M) and X and M are added to a model of Y already containing the covariates. The goal of using hierarchical data entry is to determine whether the Model with all the variables produces a better model than one in which only contain the covariates. Hierarchical data entry was used in this study.

Visualizing moderation. To make the interpretability of moderation easier, a set of estimates of Y were generated from various combinations of X and M , using the non-centered mean regression model and the plotting \hat{Y} as a function of X and M . The non-centered mean values of X and M were used as they are within the realm of plausible values for the measurement scales of ACT and SES.

Probing an interaction. There is an inherent chance component to the estimate of X 's effect on Y at any chosen value of M . This chance component is directly related to sampling error that occurs at each and every value of M . To accommodate this uncertainty, a set of post-interaction inferential tests were used to establish where, in the distribution of SES, there was an effect on NCLEX–RN scores that was different from zero and where it was not.

For dichotomous proxies the estimate of the conditional effect were calculated for X on Y when M for each of the defined groups. As discussed later, all dichotomous proxies were coded 0 and 1. The estimate of the conditional effect was calculated for X on Y when M is equal to the 10th, 25th, 50th, 75th, and 90th percentiles. This approach allowed for the categorization and ranking of the influence of the moderation effect. For all covariates the values were set to their respective mean (Hayes, 2013).

Conditional Process Analysis

Conditional Process Analysis is a statistical technique used to examine if a relationship between two or more variables is of the moderation mediation type (Hayes, 2013). A phenomenon is best understood when the effect of X on Y is researched, but also *how* X exerts its effect on Y , and *when* X impacts Y and when it does not. Once the

models are compared in addition to individual indicator diagnostics for SES in both the hypothesized mediation and moderation models, the best moderated mediated model was estimated. The goal of this conceptual model is to understand and describe the conditional nature of SES in the relationship between ACT and NCLEX–RN while also recognizing that SES directly and indirectly effects outcomes on the NCLEX–RN. The idea that a causal antecedent variable X could moderate its own indirect effect on Y through M , if the effect of M on Y depends on X , was first hypothesized by Judd and Kenny (1981). Thus, support exists for any mediation analysis to test whether the effect of M on Y is moderated by X (Kraemer, Wilson, Fairburn, & Agras, 2002; Kraemer, Kiernan, Essex, & Kupfer, 2008).

To determine the “best” moderated mediated model, some criteria were used. These criteria are situated at the Model Performance level and the Indicator Performance level. For the model as a whole, statistical significance, Pseudo- R^2 variations, smaller standard error, and full or partial moderated mediated status. For the indicators individually, statistical significance, size of the regression coefficient/Odds Ratio, and size of the confidence interval were some of the indicators reviewed.

Figure 5 is a visual representation of the hypothesized model if the same proxy for SES was found to be best suited for mediation and moderation. Figure 6 is a visual representation of the hypothesized conceptual model that was used as different proxies for SES were found for mediation and moderation.

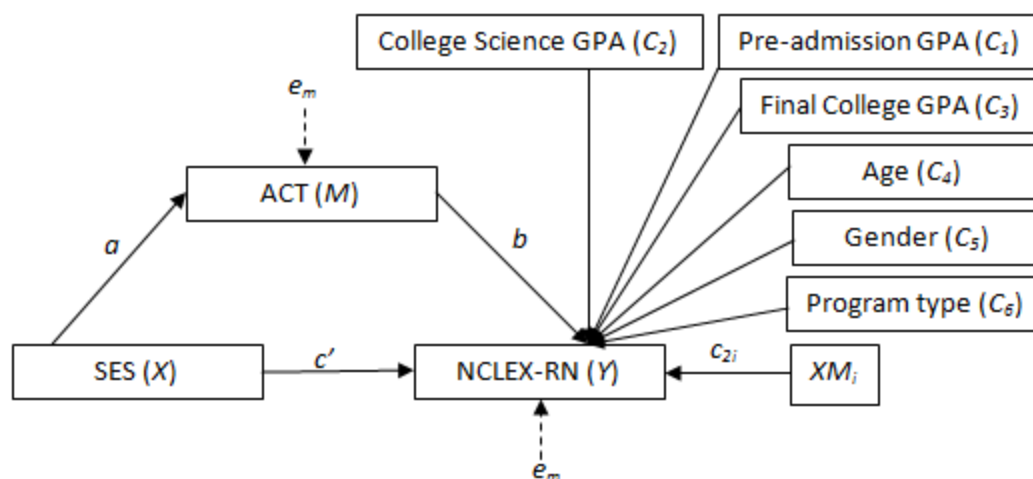


Figure 5. ACT as a mediator between SES and NCLEX–RN with SES as a moderator between ACT and NCLEX–RN while controlling for (a) pre-admission GPA (C_1), (b) college science GPA (C_2), (c) final college GPA (C_3), (d) age (C_4), (e) gender (C_5), and (f) program type (C_6).

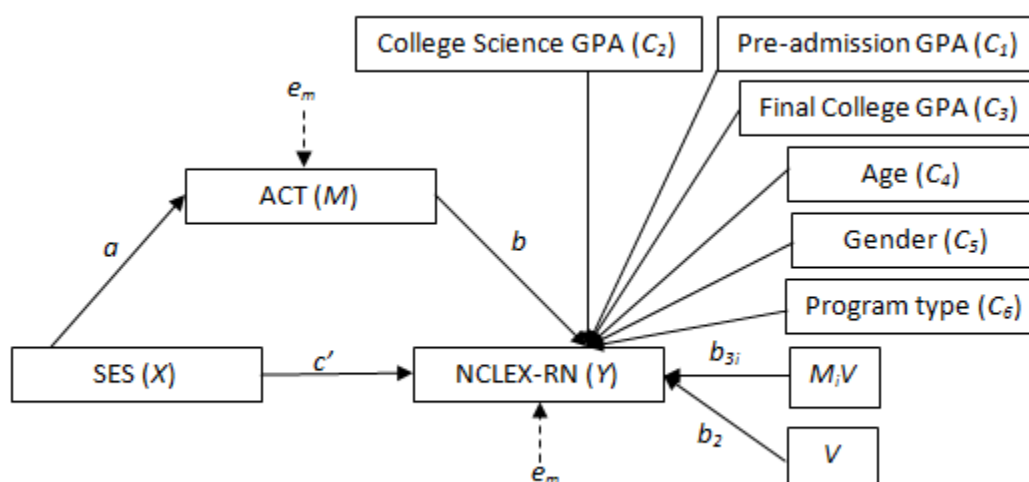


Figure 6. ACT as a mediator between SES_1 and NCLEX–RN with SES_2 as a moderator between ACT and NCLEX–RN while controlling for (a) pre-admission GPA (C_1), (b) college science GPA (C_2), (c) final college GPA (C_3), (d) age (C_4), (e) gender (C_5), and (f) program type (C_6). SES_1 and SES_2 represent two different SES proxies. Further explanation occurs in the following paragraphs.

An indirect effect is said to be conditional if the relationship between X and Y , which is mediated by M , differs in size as a function of a moderator variable or set of

variables. Similarly, it is possible for the direct effect of X on Y (i.e., effect of X on Y independent of X 's influence on Y through M) to be moderated. In this instance, the direct effect becomes contingent on a moderator and is therefore a function of that moderator. In the hypothesized conceptual model of this research the direct and indirect effect will be conditional on SES moderating the effect between ACT and the NCLEX–RN.

The equations representing the proposed conceptual model if the same proxy for SES was used are:

$$M_i = i_1 + a_i X + e_{Mi1} \quad (3.9)$$

$$Y = i_2 + c_1' X + b_{1i} M_i + c_{2i} M_i X + \sum_{i=1}^q f_i C_i + e_{y1} \quad (3.10)$$

* $f_i C_i$ mathematically represents holding the covariates constant

Where the effect of M on Y is $\Theta_{M \rightarrow Y} = b_{1i} + c_{2i} X$ and is a conditional effect that is a function of X .

If the same proxy was used for SES, X exerts its effect on Y through both direct and indirect pathways. The direct effect in this case is also conditional and links X to Y . The conditional direct effect, $c_1' + c_{2i} M$, quantifies how much two cases differ by a unit of X are estimated to differ on Y , holding C covariates constant and independent of X 's influence on Y through M . The indirect effect of X on Y through M is the product of the paths linking X to Y through M . The first of these components of the indirect effect is the path from X to M , estimated as a_i in Model (3.10), and the second component is the path from M to Y . The effect of M on Y is a function of X in Model (3.10). As noted before,

the indirect effect remains the product of the path from X to M and the path from M to Y .

In equation form the conditional indirect effect is:

$$a\Theta_{M \rightarrow Y} = a_i(b_{1i} + c_{2i}X) \quad (3.11)$$

This conditional indirect effect quantifies how differences in X map onto difference in Y , indirectly through M depending on the value of X , while holding all C covariates constant. If in the hypothesized conceptual model the indirect effect of X differs systematically as a function of X , then the mediation of X 's effect on Y by M would be moderated by X (i.e., moderated mediation). The total effect would be equal to c in a model of Y without M but including the q covariates:

$$Y = i_3 + cX + \sum_{i=1}^q fiCi + e_{Yi} \quad (3.12)$$

The total effect of X , c , estimates how much two cases that differ by a unit on X are estimated to differ on Y , statistically controlling for C .

The equations representing the actual conceptual model with the different proxies for SES are:

$$Mi = i_1 + a_iX + e_{Mi1} \quad (3.13)$$

$$Y = i_2 + c'X + b_{1i}Mi + b_2V + b_{3i}MiV + \sum_{i=1}^q fiCi + e_{y1} \quad (3.14)$$

* $fiCi$ mathematically represents holding the covariates constant

Where the effect of M on Y is $\Theta_{M \rightarrow Y} = b_{1i} + b_{3i}V$ and is a conditional effect that is a function of V .

Different proxies were used for SES; therefore X exerts its effect on Y through both direct and indirect pathways. As noted previously, the direct effect links X to Y independent of M . The direct effect still quantifies how much two cases differ by a unit

on X are estimated to differ on Y , holding M and C covariates constant. The indirect effect of X on Y through M is the product of the paths linking X to Y through M . The first of these components of the indirect effect is the path from X to M , estimated as a_i in Model (3.13), and the second component is the path from M to Y . The effect of M on Y is a function of V in Model (3.14). The indirect effect remains the product of the path from X to M and the path from M to Y . In equation form conditional indirect effect is:

$$a\theta_{M \rightarrow Y} = a_i(b_{1i} + b_{3i}V) \quad (3.15)$$

This conditional indirect effect quantifies how differences in X map onto difference in Y , indirectly through M depending on the value of V , while holding all C covariates constant. In this conceptual model the indirect effect of X differed systematically as function of V , then the mediation of X 's effect on Y by M was moderated by V (i.e., moderated mediation). The total effect was equal to c in a model of Y without M but including the q covariates:

$$Y = i_3 + cX + \sum_{i=1}^q f_i C_i + \epsilon_{Yi} \quad (3.16)$$

The total effect of X , c , estimates how much two cases that differ by a unit on X are estimated to differ on Y , statistically controlling for C .

Statistical Inference

Inferential statistics discussed in this section were used to rigorously check the descriptive claims discussed in the previous sections. The first inference was made about the conditional direct effect. The null hypothesis, that the *true conditional direct effect* = 0, was tested. If the p value was found to be less than .05, the null hypothesis was rejected. Furthermore, a 95% Confidence Interval (CI) for *true conditional direct effect*

was investigated to determine if 0 was contained within the confidence interval. A rejection of the null hypothesis for the direct effect indicated that while holding the covariates, the mediator, and the moderator constant, SES has a direct effect on NCLEX–RN scores.

Next, the indirect effect conditioned on a moderator (i.e., SES’s influence on NCLEX–RN scores through ACT as moderated by SES) was investigated. Bias-corrected bootstrap confidence intervals were used as they are robust to non-normality for a given point estimate of the conditional indirect effect for a given value of the SES, the moderator. A bias corrected bootstrap confidence interval for τ_w was computed using the steps discussed previously. Ninety-five percent bias corrected bootstrap CIs for the conditional indirect effect for SES on NCLEX–RN outcomes through ACT was calculated. If for any of the categories of SES had a bootstrap CI free of zero, this supported the claim that the conditional indirect effect is statistically significant.

Comparing Conditional Indirect Effects

The indirect effect of X on Y through M was found to be moderated at one level of the moderator. The difference between the conditional indirect effect at two values of the moderator of interest was estimated by PROCESS. After this estimation, an inferential test was used to determine if this difference is equal to zero. The 95% bias corrected bootstrap CI calculated by PROCESS was reviewed. The interval included zero, therefore the inference that the conditional indirect effect of X on Y through M is different for the two values of the moderator cannot be made with confidence.

Variables

ACT. The ACT assessment is a continuous variable measured on an interval measurement scale. The ACT has four subtests which include: (a) English, (b) Mathematics, (c) Reading, (d) and Science (ACT Inc., 2015). The composite score and each subtest range from 1 (low) to 36 (high). The composite score is the average of the four test scores rounded to the nearest whole number. Fractions less than one-half are rounded down, and fractions one-half or more are rounded up. ACT scores required for acceptance into the nursing program at the University where the sample is being collected are dependent on high school GPA. A student with a high school GPA between 2.75 and 2.99 is required to have a composite ACT score of 22, and a science ACT of 22. A high school GPA between 3.0 and 3.29 means the student must have a composite ACT score of 21 and a science ACT of 21. A composite ACT score of 20 and a science ACT score of 20 is required if a student's high school GPA is greater than 3.3. In other words as a student's GPA goes up, he or she can have a lower ACT score. Furthermore, the College of Nursing reserves the right to admit any person they feel is a good candidate regardless of GPA and ACT (C. Good, personal communication, May 1, 2015). The range of the ACT composite for this study was 13 to 33. Students only with SAT scores will not be eligible for inclusion. Although ACT and the College Board have completed a concordance study that demonstrates a strong positive relationship between the ACT and the SAT (ACT Inc., 2015), exact conversion is not possible.

SES. As mentioned in Chapter 2, four different variables were used to approximate SES. These include: (a) Pell Grant Eligibility, (b) Student Race, (c) College

Generation, and (d) Zip Code. Pell Grant Eligibility was a dichotomous variable measured on the nominal scale. Participants who were Pell Grant Eligible were coded 0 and those not eligible were coded 1. Race was treated as a categorical variable and was measured on the nominal measurement scale. Participants were coded 0 for African, Hispanic, Native American, and Native Alaskan, 1 for Caucasian, and 2 for Asian. College Generation was discrete and measured as dichotomous. Students were coded 0 for first-generation students and 1 for non first-generation students. Zip Code is a categorical variable and is measured on the nominal measurement scale. Students from suburban Zip Codes were coded 2, from urban Zip Codes were coded 1, and from rural Zip Codes were coded 0. The Zip Codes were determined to be a specific category based on the majority of the residents. For example, a Zip Code that was 51% urban, 28% suburban, 21% rural was assigned to the urban category. The percentages used to calculate the category were based on the US Census Bureau Reports.

GPA—preadmission, college science, and nursing program. Three of the covariates are different measures of GPA. These include Pre-admission GPA, College Science GPA, and Final College GPA. In all three cases GPA was treated as a continuous variable and was measured on the interval scale from .00 to 4.0. The range for Pre-admission GPA for this study was between 1.35 to 4.0, for College Science GPA it was 1.96 to 4.0, and for Final College GPA it was 2.37 to 4.0.

Age. Age is a continuous variable measured at the ratio level. The range of age for this study was 21 to 49. Age was measured as a continuous variable. The participant's age on the date of the NCLEX–RN was used.

Gender. Gender is a dichotomous variable and was measured on the nominal scale with 1 Female and 0 for Male.

Nursing program type. Program is a dichotomous variable and was measured on the nominal scale. Students were coded 0 for a traditional four-year program and 1 for an accelerated program.

Moderator Research Questions

The following questions address the relationship between ACT scores and NCLEX–RN outcomes and the hypothesized moderator of SES. As was mentioned previously, proxies for SES were tested for the moderation effect. The goal of these research questions was to determine if SES is indeed a moderator of the relationship between ACT and NCLEX–RN and if so which of the proposed proxies best demonstrates this moderator effect.

1. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on Pell Grant Eligibility controlling for pre-admission GPA, college science GPA, final college GPA, gender, age, and program type?
2. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on Student Race controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?
3. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on College Generation controlling for pre-

admission GPA, college science GPA, final college GPA, age, gender, and program type?

4. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on Home Zip Code, controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?

Mediator Research Questions

The following questions address the relationship between SES and NCLEX–RN and the hypothesized mediator ACT. ACT, as mentioned previously, is often considered one of the strongest predictors of NCLEX–RN. However, there is a debate in the literature if ACT is truly a measure of knowledge or a product of SES. Through the following questions using the previously discussed proxies, the goal was to determine if the predictive power of ACT on the NCLEX–RN is stemming from the influence of SES on ACT. In other words, does ACT represent SES when predicting NCLEX–RN scores?

1. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using Estimated Family Contribution controlling for pre-admission GPA, college science GPA, final college GPA, gender, age, and program type?
2. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using Student Race controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?

3. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using College Generation controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?
4. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using Home Zip Code controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?

Conditional Process Analysis

The hypothesized mediation and moderation effects were statistically significant at certain levels of SES, therefore a conditional process analysis was used to suggest the best fitting model between SES, ACT scores, and NCLEX–RN outcomes.

1. What is the best fitting model/relationship between SES, ACT scores, and NCLEX–RN scores through a Conditional Process Analysis?

CHAPTER IV

RESULTS

In this section, the results are outlined. The sample was collected from a large Midwestern University and includes eligible College of Nursing (CON) graduates from Fall 2010 through Spring 2015. To be considered for inclusion, participants must have had a complete data set for the key variable (i.e., NCLEX–RN, ACT Composite, and all four potential proxies for SES). This is followed by a detailed description of the final analysis sample used to address the research questions of this study. Data included five quantitative variables (i.e., Age, ACT composite, Pre-admission GPA, College Science GPA, and Final College GPA), and six categorical variables (i.e., Gender, Program Type, Pell Grant Eligibility, Student Race, College Generation, Zip Code, and NCLEX–RN).

Missing Data

The total sample size of eligible participants was 1,176, of which 276 (23.4%) contained missing data. As a result of the inclusion criteria, missing data were only found with Pre-admission GPA, College science GPA, or both. A dummy variable titled “MissingGPA” was created to investigate the nature of the missing GPA values (i.e., were the missing values random or non-random in nature). Participants with no missing GPA data were coded 1, and participants with one or more of the GPAs (i.e., Pre-admission and/or pre-nursing science GPA) were coded 0. In the following sections all the variables are investigated to determine if cases with missing values are statistically different than cases without missing data. First, categorical variables are explored

followed by investigation of the continuous variables. Determination and rationale on how the missing values were handled will be outlined in the following paragraphs.

Categorical Variables

Categorical variables were assessed to determine if there was a difference between actual and expected frequencies. Statistical assumptions of the Chi-Square test were investigated to determine its appropriateness. Independence was not violated. Expected frequencies were greater than five, indicating proper statistical power. Table 2 summarizes the Chi-Square tests for categorical variables. Statistically significant results were found for two categorical variables when comparing cases with and without missing data. These results suggest that estimating missing values is indicated.

Continuous Variables

Continuous variables were assessed to determine if there was a mean difference between cases with and without missing data. Statistical assumptions of the Independent Sample *t*-test were investigated to determine its appropriateness. Independence was not violated. Homogeneity of variance (HOV) was tested by using the Levene statistic. Heterogeneity of Variance was suggested with both the Age and Final College GPA variables. Normality was then examined. Non-normality was evidenced through the inspection of the histograms. Age appeared to be positively skewed and leptokurtic, Pre-admission GPA appeared to be negatively skewed and leptokurtic, and College Science GPA appeared to be platykurtic. Final College GPA and ACT were not skewed or kurtotic.

Table 2

Chi-Square Tests for Categorical Variables and Missing GPA

Variable	Missing GPA		χ^2	df
	Missing GPA	All GPA		
Gender			.01	1
Male	40.2	131.6		
Female	235.6	768.4		
Program Type			11.73**	1
Traditional	244.1	759.9		
Accelerated	31.9	104.1		
Pell Grant			.81	1
Eligible	81.0	264.0		
Ineligible	195.0	636.0		
Student Race			.02	2
Other	15.7	51.3		
Caucasian	257.0	838.0		
Asian	3.3	10.7		
Generation			26.05**	1
First-Generation	53.3	173.7		
Non First-Generation	222.7	726.3		
Zip Code			.04	2
Rural	42.5	138.5		
Urban	202.3	659.7		
Suburban	31.0	101.0		
NCLEX–RN			2.27	1
Fail	34.7	113.3		
Pass	241.3	786.7		

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

Cramer's V was used for variables with three categories.

Next, Probability-Probability plots (P-P plots) were investigated. The P-P plots supported the findings. Normality was then examined through skewness and kurtosis z -scores. As hypothesized from the histograms and P-P plots, the z -scores of Age, Pre-admission GPA, and College science GPA suggest non-normality. Finally, the Kolmogorov-Smirnov (K-S) statistic was investigated to determine univariate normality. Statistically significant results for the K-S statistic were found for all the variables except for Final College GPA. See Table 3 for frequency and normality statistics discussed in this section.

Considering, to varying degrees, each variable violated a statistical assumption of the Independent Samples t -test, variable transformation was investigated. The Levene statistic was interpreted for both Age and Final College GPA after variable transformation. There was not a specific transformation (i.e., log, square root, square, cube, or reciprocal) that resulted in the assumption of HOV being met with both variables. Furthermore, transformation of data, where statistically appropriate, can negatively impact the performance of hypothesized models (Lomax & Hahs-Vaughn, 2012). Therefore, data were left untransformed.

Table 3

Frequency and Normality Statistics of Continuous Variables Untransformed

Variable	<i>n</i>	<i>M (SD)</i>	Skewness (<i>SE</i>)	<i>z</i> (Skewness)	Kurtosis (<i>SE</i>)	<i>z</i> (Kurtosis)	<i>D</i>	<i>F</i>
Age	1,176	24.28(2.8)	2.68(.07)	37.75***	10.84(.14)	75.83***	.255***	14.91***
Pre-admission GPA	1,126	3.43(.41)	-.99(.07)	13.61***	1.37(.15)	9.37***	.086***	1.83
College science GPA	942	3.37(.40)	-.14(.08)	-1.74	-.77(.16)	4.82***	.070***	.37
Final College GPA	1,176	3.32(.31)	-.16(.07)	-2.24	-.39(.14)	-2.69	.028	11.05***
ACT	1,176	22.3(3.25)	.18(.07)	2.59	-.091(.14)	.63	.096***	.17

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

D denotes the K-S statistics. *F* denotes the Levene Statistic.

The t -test is very robust to non-normality for a two-tailed test, especially with large samples (Lomax & Hahs-Vaughn, 2012). Additionally, larger sample sizes (e.g., $n > 200$) result in small standard errors, and therefore increase likelihood of having statistically significant z scores, K-S statistics, and Levene statistics (Keith, 2014). Considering the previously mentioned potential consequence of data transformation, the inability to meet HOV through transformations, the power generated from this study's large sample size, and the robustness of the Independent Samples t -Test, it was decided that the Welch t' was most appropriate for interpretation.

The Welch t' test is appropriate when the population variances and the sample sizes are unequal (Lomax & Hahs-Vaughn, 2012). As before, the independence assumption was not violated. The normality assumption, depending on interpretation, remained violated for a minimum of two of the variables and for potentially four of the variables. However, as stated above the t -test is robust to non-normality.

After recoding each of the variables by rank in SPSS, an Independent Samples Welch t' Test was run for all continuous variables to determine if there is a significant mean difference between cases with and without missing data. Results reported in Table 4 are for when equal variances are not assumed. From the table, the two groups (i.e., cases with missing data and cases without) had significantly different means on four of the five variables. These results suggest that estimating the missing values are essential for model accuracy and reliability.

Table 4

Welch t' Test - Missing Data Versus All Data

Variable	<i>n</i>	<i>M (SD)</i>	<i>t</i>	<i>df</i>	<i>M</i> Difference	<i>SE</i> Difference	<i>CI</i>
Age		24.28(2.88)	3.46***	368.76	.80	.23	.35, 1.26
Missing GPA	276	24.89(3.57)					
All GPA	900	24.09(2.60)					
Pre-admission GPA		3.43(.41)	-2.76***	323.78	-.09	.03	-.15, -.03
Missing GPA	226	3.36(.45)					
All GPA	900	3.45(.41)					
College science GPA		3.37(.41)	.61	44.26	.04	.07	-.10, .18
Missing GPA	42	3.41 (.34)					
All GPA	900	3.37(.41)					
Final College GPA		3.32(.31)	-5.09***	408.69	-.12	.02	-.16, -.07
Missing GPA	276	3.23(.34)					
All GPA	900	3.35(.30)					
ACT		22.3(3.25)	-3.87*	455.33	-.86	.22	-1.30, -.42
Missing GPA	276	21.7(3.24)					
All GPA	900	22.57(3.23)					

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

Welch t' test with normality not assumed. Means and Standard Deviations reported prior to transforming data into rank order. All other statistics are reported after to transforming data into rank order.

Data Estimation

Two of the most acceptable ways to estimate missing data (i.e., expectation maximization and multiple imputations) were considered. To determine which estimation method would be adopted, Little's Missing Completely at Random (MCAR) Test (Little, 1988) was performed. MCAR is used to test the null hypothesis that the missing values are random in nature. Expectation maximization requires MCAR, whereas multiple imputations does not assume MCAR. The result of Little's MCAR test

was statistically significant ($\chi^2 = 97.249$, $df = 11$, $p < .001$), indicating that the null hypothesis should be rejected and the data are not MCAR (Tabachnick & Fidell, 2013). Based on these findings, multiple imputation through the Missing Values add on in SPSS was performed. The results of the fifth iteration of the multiple imputations (i.e., the data set with estimated data) was compared to the original data set (i.e., the data set with missing values). This comparison is discussed in this section.

As mentioned previously, the independence assumption is the only assumption not violated for Independent Samples *t*-Test. Additionally, data transformation was not implemented. After recoding each of the variables by rank, in SPSS, an Independent Samples Welch *t*' Test was run for continuous variables to determine if there was a significant mean difference between those with and without missing data.

Results reported in Table 5 are for equal variances not assumed. From the table, the two groups (i.e., original data and imputation five data) did not have statistically different group means. These results indicate that the complete data set (i.e., imputation five data) is appropriate for analysis (Tabachnick & Fidell, 2013). In addition, there was not a comparison for variables with all cases being complete as these are identical in both data sets.

Table 5

Welch t' Test Original Data Versus Imputation 5 Data

Variable	<i>N</i>	<i>M (SD)</i>	<i>t</i>	<i>df</i>	<i>M Difference</i>	<i>SE Difference</i>	<i>CI</i>
Pre-admission GPA			.36	2296.42	30.58	84.41	-134.97, 196.14
Original	1,126	3.43(.41)					
Imputation 5	1,176	3.42(.44)					
College science GPA			1.15	2021.25	99.40	86.32	-69.99, 268.80
Original	942	3.37 (.41)					
Imputation 5	1,176	3.34(.42)					

Note. Welch *t'* test with normality not assumed. Means and Standard Deviations reported prior to transforming data into rank order. All other statistics are reported after to transforming data into rank order.

Analysis Sample Demographics

In this section the descriptive statistics for the analysis sample are discussed. The appropriateness and limitations of the data set are outlined. In this initial section, the focus is on the demographics of the sample. The sample demographics are compared to the university population where the sample was collected and to the US RN workforce. Following the demographics report, descriptive statistics of the remaining variables are outlined.

The year-restricted range sample size was 1,176, of which 85.4% were female. This differs by approximately 24% when compared to the student population at the large public university; it only differs by 4.5% (i.e., 89.9% compared to 85.4%) when compared to the RN work force in the US (USDHHS, 2013). The mean age of the analysis sample was 24.28 ($SD = 2.878$; $Mdn = 23.00$, $IQR = 2.00$). When compared to the student population as a whole, the CON graduates were slightly younger (i.e., 24.8 compared to 25.7). As expected, the participants were considerably younger from the US RN work force (i.e., 46.6 years old). Furthermore, 71.9% of participants were 24 years of age or younger with only 1.2% being older than 35. Compared to the workforce and the student population at the large public university the number of ethnic minorities was decreased in the sample.

Only 5.7% of the sample identified as Black, Hispanic, American Indian, Alaskan, multi-racial, or as Native Hawaiian/Pacific Island compared to 13.81% at the large public university. There was even a larger disparity when comparing the US RN

population to sample race demographics (i.e., 16.5% of RNs in the US identify as non-Caucasian or Asian).

Analysis Sample Descriptives

The descriptive statistics for the remaining variables (i.e., non-demographic variables) are discussed in this section. For ease, this section was separated into a key variables section that discusses SES and its proposed proxies (i.e., Pell Grant Eligibility, Student Race, Zip Code, and College Generation) and NCLEX-RN, and a covariate section that focuses on the remaining variables.

Key Variables

Rather consistent with the national pass rate of 87.93% over the last six years on the NCLEX–RN, the sample pass rate was 87.4%. The sample range for the ACT composite was 13-33 with a mean of 22.37($SD = 3.25$). The national average has varied from 20.9 in 2013 to 21.1 in 2011, with the average over the last six years being 21. Similar to the sample of this research study, the state of Ohio, on average, has outperformed the national average. The state of Ohio’s ACT composite average over the last 6 years is 21.9 (ACT, 2015).

The descriptive statistics for Student Race were discussed in the previous section. Self-identified Caucasian make up 93.1% of the sample. As mentioned in Chapter 3, variables with a 90% to 10% split or more between categories should not be considered for use in inferential analyses (Rummel, 1988; Tabachnick & Fidell, 2013). In other words, though the literature suggests that Student Race may serve as a suitable proxy for SES, in this research study the sample is not sufficient to test this hypothesis.

Pell Grant eligibility on the other hand, based on descriptive statistics was suitable for investigation as a suitable proxy for SES. A minority of the sample, 345 or 29.3% of participants, were Pell Grant eligible; however the 90% to 10% split was achieved, suggesting inferential statistical analysis was appropriate. Similar results were found for the College Generation variable. A majority of the sample, 949 or 80.7% of participants, were non first-generation students. As with the Pell Grant eligibility variable, the suggested 90% to 10% split was achieved, indicating inferential statistical analysis was appropriate.

The final hypothesized proxy for SES was Zip Code. As mentioned earlier, Zip Code was separated into three categories (i.e., rural, urban, and suburban). The bulk (73.4%) of the sample was from urban areas. Rural and suburban zip codes accounted for 15.4% and 11.2% of the participants, respectively.

Covariate Variables

Two of the covariates, Age and Gender, were previously delineated in the *Analysis Sample Demographics* section above. Nursing program type is the third covariate. As hypothesized, a majority of participants graduated from the traditional four-year program ($n = 1040$, 88.4%). The remaining three covariates are GPA related. The participants had a mean Pre-admission GPA of 3.43 ($SD = .418$; $Mdn = 3.5$, $IQR = .580$) and range of 1.35 to 4.00. These findings are similar to the results found for College Science and Final College GPA. The mean for College Science GPA was 3.35 ($SD = .416$; $Mdn = 3.34$, $IQR = .6397$) with a range of 1.96 to 4.00. The range for Final

College GPA was 2.37 to 4.00, with a mean of 3.32 ($SD = .312$; $Mdn = 3.32$, $IQR = .4508$).

Assumptions

In this section the screening of the assumption of logistic regression is discussed. The assumptions include: (a) Independence, (b) Linearity, and (c) Multicollinearity. Additionally, investigation of incomplete information from the predictors occurs. These assumptions along with the methods implemented to investigate them are discussed in the following paragraphs. Additionally, resolutions to violations of the assumptions are proposed, when appropriate. After an in-depth review, a determination is made if the data are suitable for analysis.

Independence. Studentized residual plots suggest independence of errors. There was no systematic pattern noted in the residual plots with the data points falling in a band between -3.0 and +3.0. Furthermore, the Durbin-Watson statistic was 2.01, which indicates independence of errors. Finally, the assumption of independence was assumed to be met as these data do not contain repeated measures or other forms of dependent data.

Linearity. The interaction terms between each continuous predictor and the logit of the dependent variable were investigated through the Box-Tidwell test. The Box-Tidwell test determines if the interaction term between the predictor and its natural log transformation is significant. Statistically significant interaction terms indicate that the linearity assumption is violated. From Tables 6, 7, and 8 it can be determined the assumption of linearity is met for each of the continuous variables for each proxy of SES.

Table 6

Linearity Assumptions with Pell Grant Eligibility as SES Proxy

Variable	<i>B</i>	<i>SE</i>	<i>df</i>
Age *Ln of Age	.10	.10	1
Pre-admission GPA * Ln of Pre-admission GPA	-3.18	1.84	1
College Science GPA * Ln of College Science GPA	-2.71	2.73	1
Final College GPA * Ln of Final College GPA	-8.06	5.30	1
ACT Composite * Ln of ACT Composite	.57	.37	1

Note. All interaction terms non-significant at $p < .05$.

Table 7

Linearity Assumptions with College Generation as SES Proxy

Variable	<i>B</i>	<i>SE</i>	<i>df</i>
Age *Ln of Age	.11	.29	1
Pre-admission GPA * Ln of Pre-admission GPA	-3.11	1.84	1
College Science GPA * Ln of College Science GPA	-2.60	2.74	1
Final College GPA * Ln of Final College GPA	-8.61	5.32	1
ACT Composite * Ln of ACT Composite	.56	.37	1

Note. All interaction terms non-significant at $p < .05$.

Table 8

Linearity Assumptions with Zip Code as SES Proxy

Variable	<i>B</i>	<i>SE</i>	<i>df</i>
Age *Ln of Age	.07	.29	1
Pre-admission GPA * Ln of Pre-admission GPA	-3.32	1.85	1
College Science GPA * Ln of College Science GPA	-2.87	2.75	1
Final College GPA * Ln of Final College GPA	-5.53	5.32	1
ACT Composite * Ln of ACT Composite	.60	.37	1

Note. All interaction terms non-significant at $p < .05$.

Multicollinearity. Multicollinearity was checked by exploration of the tolerance and variance inflation (VIF) statistics. From Tables 9, 10, and 11 it was determined that multicollinearity was not of concern, as all the tolerance statistics were over .1 and all the VIF values were less than 10. The condition index of each dimension, which represents the square root of the ratio of the largest eigenvalue to the eigenvalue of interest, was investigated to determine if there were suggestions of multicollinearity. The largest condition index, regardless of the SES proxy, was only .795 times greater than the next condition index. Condition index values that are substantially larger than others may indicate multicollinearity (Lomax & Hahs-Vaughn, 2012). Based on the slight increase from the second to the largest condition index, in each model, multicollinearity was not

indicated in the analysis sample and that the un-centered cross-products matrix was appropriately conditioned for each model.

Table 9

Collinearity Statistics of the Sample Analysis Data with Pell Grant Eligibility as SES Proxy

Variable	Tolerance	VIF	Eigenvalue	Condition Index
Gender	.93	1.07	.88	2.96
Age	.75	1.33	.25	5.58
Pre-admission GPA	.61	1.64	.12	7.88
College Science GPA	.63	1.59	.02	17.83
Final College GPA	.53	1.89	.01	25.45
Program Type	.81	1.24	.00	29.88
Pell Grant Eligibility	.91	1.10	.00	44.30
ACT Composite	.69	1.44	.00	56.21

Table 10

Collinearity Statistics of the Sample Analysis Data with College Generation as SES Proxy

Variable	Tolerance	VIF	Eigenvalue	Condition Index
Gender	.93	1.07	.88	2.30
Age	.76	1.32	.18	6.63
Pre-admission GPA	.61	1.65	.12	7.99
College Science GPA	.63	1.59	.02	17.92
Final College GPA	.53	1.90	.01	25.59
Program Type	.85	1.17	.01	30.02
ACT Composite	.70	1.44	.00	44.81
College Generation	.97	1.03	.00	56.32

Table 11

Collinearity Statistics of the Sample Analysis Data with Zip Code as SES Proxy

Variable	Tolerance	VIF	Eigenvalue	Condition Index
Gender	.93	1.07	.87	2.97
Age	.76	1.32	.21	6.13
Pre-admission GPA	.61	1.64	.12	7.95
College Science GPA	.63	1.58	.03	17.78
Final College GPA	.53	1.89	.01	25.54
Program Type	.86	1.16	.01	30.02
ACT Composite	.70	1.44	.00	44.44
Zip Code	.99	1.00	.00	56.30

Incomplete information from predictors. Through the investigation of crosstabulation tables, that included categorical predictors and the outcome variable, the expected frequencies were evaluated. First, the crosstabulation tables that included discrete variables were reviewed. From Table 12, the expected cell count for all of the discrete variables was greater 5 indicating there was sufficient variability to appropriately implore Chi-Square tests. Next, the crosstabulation tables for categorical variables were studied. Similar to the crosstabulation tables for the discrete variables the Zip Code crosstabulation table expected cell count was greater than 5 for all three Zip Code tables. However, as was expected the crosstabulation table for Student Race did have an expected cell count below 5. Combined with not meeting the 90/10% split discussed above, this information indicates Student Race, in the sample analysis data, was not

appropriate for inferential statistics. The correlation of both the discrete and categorical variables with the outcome variable was reviewed. Pearson Chi-Square test was used to determine if a correlation between discrete variables existed. Cramer's V was used to determine the strength of association for categorical variables. All results can be found in Table 12; however it should be noted that College Generation and Zip Code did not have a significant correlation with NCLEX–RN. These findings suggest that College Generation and Zip Code have no meaningful direct effect on the NCLEX–RN; however the possibility of an interaction/moderated effect and/or an indirect or conditional indirect effect has not been determined.

Assumption conclusion. As mentioned above, the three basic assumptions of logic regression were met. Additionally, non-zero cell counts, complete separation, and over dispersion of data were found to be nonexistent in the sample analysis data. The sample size of 1,176 is greater than the value of 100 suggested by Lomax and Hahs-Vaughn (2012). These finding further supported that the sample analysis data were appropriate for logistic regression. The next two sections talk over the mediation and moderation analysis. The final section of this chapter outlines the conditional process analysis (i.e., path analysis) of the data.

Table 12

Chi-Square Tests for Categorical Variables and NCLEX–RN

Variable	NCLEX–RN		χ^2	df
	Fail	Pass		
Gender			5.42*	1
Male	21.6	126.4		
Female	150.4	877.6		
Program Type			6.28*	1
Traditional	130.9	909.1		
Accelerated	17.1	118.9		
Pell Grant			4.18*	1
Eligible	43.4	301.6		
Ineligible	104.6	726.4		
Student Race			.018*	2
Other	8.4	58.6		
Caucasian	137.8	957.2		
Asian	1.8	12.2		
Generation			.98	1
First-Generation	28.6	198.4		
Non First-Generation	119.4	829.6		
Zip Code			.01	2
Rural	22.8	158.2		
Urban	108.6	754.4		
Suburban	16.6	115.4		

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

Cramer's V was used for variables with three categories.

Moderator Research Questions

Through logistic regression, the relationship between ACT scores the NCLEX–RN outcomes and the hypothesized moderators of SES were investigated. As was mentioned in Chapter 3, proxies for SES were tested for the moderation effect. The goal of these research questions was to determine if SES is indeed a moderator of the

relationship between ACT and NCLEX–RN and if so, which of the proposed proxies best demonstrates this moderator effect.

1. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on Pell Grant Eligibility controlling for pre-admission GPA, college science GPA, final college GPA, gender, age, and program type?
2. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on College Generation controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?
3. Does the relationship between ACT scores and NCLEX–RN scores (i.e., Pass/Fail) change depending on Home Zip Code, controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?

Moderated Logistic Regression

PROCESS, the macro developed by Hayes (2013) for investigating moderation, mediation, and moderated mediation, along with binary logistic regression through SPSS (i.e., version 23), were used to determine the moderator effect. The final model (i.e., Model 3) was identical for both PROCESS and binary logistic regression. The benefit of SPSS to PROCESS is that it supplies statistics for the initial models and not just the final model. The basic moderation model (i.e., PROCESS Model 1, refer to Figure 7), with the covariates was used as the moderation model. To prevent redundancy, all statistical

findings are done so with the understanding that covariates are under statistical control. The statistics, for block 0 (i.e., Model 1) and block 1 (i.e., Model 2), were the same for all three of the hypothesized SES moderators. This makes logical sense, as Model 1 only has the intercept (i.e., the constant) as a predictor. Model 2, in addition to constant, included all 6 of the covariates, which were the same regardless of the SES proxy. To prevent redundancy, the process in which the first two models were evaluated is outlined here. Following this outline, the results from each of the final models is shared.

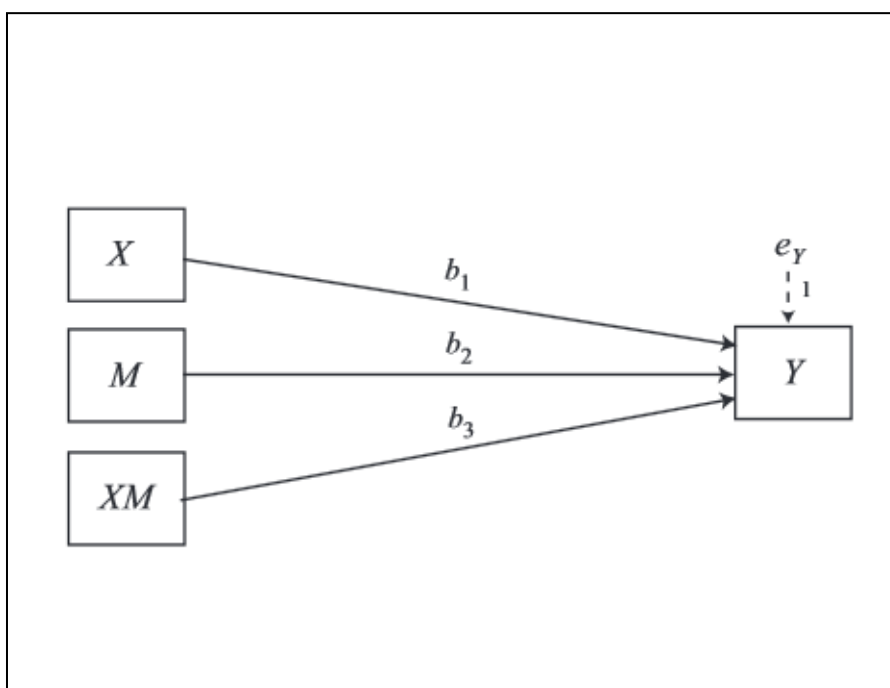


Figure 7. Statistical representation of PROCESS Model 1. This model was used to determine moderation effect of the SES proxies on the relationship between ACT and NCLEX–RN. Conditional effect of X on $Y = b_1 + b_3M$

Model 1. First, the log-likelihood of the Model 1 (i.e., the model with only the constant) was interpreted to determine the fit of the model to the data. The overall fit of the model was evaluated by interpreting the -2 log-likelihood (-2LL) statistic. The log-

likelihood was multiplied by -2 to equate the distribution to a Chi-Square distribution, therefore allowing for comparison from model to model. Smaller -2LL values indicate better model fit. The log-likelihood and therefore the -2LL are based on summing the probabilities associated with the predicted and actual outcomes. Furthermore, the log-likelihood is an indicator of how much unexplained information exists after the model has been fitted to the data. Overall, each base model correctly classified 87.4% of cases and had a -2LL of 890.047.

Next, the model summaries were reviewed. SPSS supplies two model summaries, one for variables in the initial equation and one for variables not in the equation. The only variable in the initial equation (i.e., Model 1), as mentioned previously, was the intercept. The variables not in the equation were the covariates (i.e., Gender, Age, Pre-admission GPA, College science Science GPA, Final College GPA, and Program Type). According to the model summary, adding all six covariates to Model 1 would decrease the -2LL by 95.022, a statistical significant decrease. Based on the literature reviewed in Chapter 3, and these findings, all of the covariates were entered in the second model.

Model 2. After the covariates were added to Model 1 the -2LL of Model 2 was assessed to determine its overall fit. The -2LL, as predicted, decreased by 95.022. Overall, Model 2 correctly classified 87.3% of cases and had a -2LL of 795.026. As with Model 1, Model 2 Chi-Square statistic was investigated to determine if the new model (i.e., Model 2) was performing better than the initial model (i.e., Model 1). The statistically significant Chi-Square Test ($\chi^2 = 95.022$, $df = 6$, $p < .001$) suggests that

Model 2 predicts if a case passed or failed the NCLEX–RN significantly better than Model 1.

Next the R -statistics, the partial correlation between the outcome variable and each of the predictor variables, were considered. Larger R -statistics are often preferred as they indicate better model fit. Both SPSS and PROCESS supplied three different R -statistics. Related to limitations of both the Wald statistics and the Cox and Snell statistics, the Nagelkerke's R^2 was interpreted. A larger Nagelkerke's R^2 is preferred as it suggests the predictors, as a set, reliably distinguished between participants who were successful on the NCLEX–RN and those who were not (Nagelkerke, 1991). Nagelkerke's R^2 for Model 2 was .146. To support the suggestion of Nagelkerke's R^2 the Hosmer and Lemeshow test was evaluated for statistical significance (Hosmer, Lemeshow, & Sturdivant, 2013). The non-significant results ($\chi^2 = 12.344$, $df = 8$, $p = .137$) indicate good model fit between the model and the data.

Model 3. Before outlining each of the final models (i.e., Model 3 of each proxy) an explanation of confidence intervals with PROCESS is warranted. The confidence interval for the z -statistic, for each predictor, was interpreted to determine if zero was contained within the upper and lower parameters. If the lower and upper limits contain zero, the null hypothesis could not be rejected, suggesting that the predictor may have no meaningful predictability of the NCLEX–RN. Unlike traditional binary logistic regression where there is an Odds Ratio (i.e., $Exp(B)$) of each predictor provided, PROCESS simply provides the confidence intervals just mentioned. The next three sections focus on each one of the moderator related research questions.

Moderator research question 1: Pell Grant. The process outlined to evaluate Model 2 was followed to evaluate Model 3. ACT, Pell Grant Eligibility, and their interaction term were added to the model. The -2LL of Model 3 was assessed to determine its overall fit. The -2LL decreased by 26.677. Overall, Model 3 correctly classified 87.7% of cases and had a -2LL of 768.348. As with the previous models, the Chi-Square statistic was investigated to determine if the new model (i.e., Model 3) was performing better than the previous model (i.e., Model 2). The statistically significant Chi-Square Test ($\chi^2 = 26.677$, $df = 3$, $p < .001$) suggests that Model 3 predicts if a case passed or failed the NCLEX–RN significantly better than Model 2. Next the *R*-statistic, the partial correlation between the outcome variable and each of the predictor variables, was considered. The Nagelkere's R^2 of Model 3 increased slightly to .185. As with the previous model, the Hosmer and Lemeshow test was evaluated for statistical significance. The non-significant results ($\chi^2 = 3.725$, $df = 8$, $p = .881$) indicate good model fit between the model and the data. These results suggest the predictors, as a set, reliably distinguished between participants who were successful on the NCLEX–RN and those who were not. From Table 13, individual coefficients, as hypothesized from the literature, were significant for a majority of the covariates.

Surprisingly, the coefficients of ACT, Pell Grant Eligibility, and their interaction (i.e., ACT x Pell Grant Eligibility) were not significant. However, the interaction was probed to determine if the value of ACT related to NCLEX–RN varied amongst those who are and are not eligible for Pell Grants. From Table 14, participants who were not Pell Grant Eligible had a significant moderation effect of ACT on NCLEX–RN ($B =$

.2166, $SE = .0454$; $z = 4.7721$, $p < .001$). As shown in Figure 8, as ACT scores increased, the probability of passing the NCLEX–RN for those who were Pell Grant Ineligible was significantly higher. However, the opposite can be seen for those who were Pell Grant Eligible. That is, the effect of ACT on the NCLEX–RN was only significant for those who are not Pell Grant eligible.

Table 13

Pell Grant Eligibility

Variable	<i>B</i>	<i>SE</i>	<i>z</i>	<i>95% CI</i>
Constant	-3.82	1.76	-2.17	-7.26, -.38
Gender	.53	.245	2.18*	.05, 1.01
Age	-.08	.032	-2.51*	-.14, -.02
Pre-admission GPA	-.53	.27	-1.98*	-1.05, -.01
College Science GPA	-.01	.28	-.027	-.55, .53
Final College GPA	2.05	.41	5.05***	1.25, 2.84
Program Type	1.28	.42	3.08**	.47, 2.10
ACT	1.08	.06	1.92	-.01, .22
Pell Grant	-2.29	1.41	-1.62	-5.06, .48
Pell Grant X ACT	.11	.07	1.62	-.02, .22

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

Table 14

Conditional Effect of ACT on NCLEX–RN at Values of Pell Grant Eligibility

Variable	<i>B</i>	<i>SE</i>	<i>z</i>	95% <i>CI</i>
Pell Grant Eligible	.12	.06	1.92	-.01, .22
Pell Grant Ineligible	.22	.05	4.77***	.13, .31

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

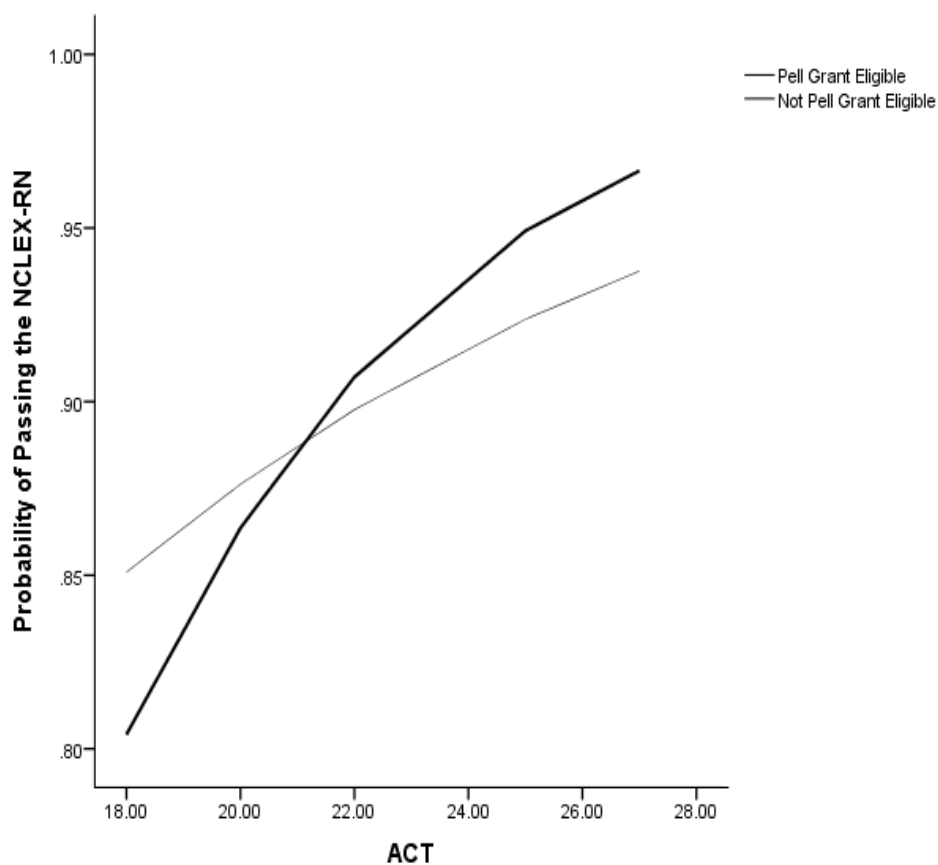


Figure 8. Conditional Effect of ACT on NCLEX–RN at values of Pell Grant Eligibility. Note. Change in the slope of the line occurs at the 10th, 25th, 50th, 75th, and 90th, percentiles of ACT.

Pell Grant Eligible participants who, on average, earned an 18 on the ACT had an 85.1% chance of passing the NCLEX–RN compared to 80.4% for those who were Pell Grant Ineligible. However, the inverse is true for participants who had higher ACT scores. For instance, participants who were Pell Grant Eligible who, on average, earned 27 on the ACT had a 93.8% chance of passing the NCLEX–RN compared to 96.7% for those who were Pell Grant Ineligible. In other words, those who were Pell Grant Eligible had a non-significant increase of 8.7% as ACT score increased compared to a significant increase of 16.3% for those who were Pell Grant Ineligible. The values of 18 and 27 were selected as they represent the 10th and 90th percentile of ACT composite scores.

Moderator research question 2: College Generation. The process outlined to evaluate Model 2 was followed to evaluate Model 3. ACT, College Generation, and their interaction term were added to the model. The -2LL of Model 3 was assessed to determine its overall fit. The -2LL decreased by 26.311. Overall, Model 3 for College Generation correctly classified 87.7% of cases and had a -2LL of 768.715. As with the previous models the Chi-Square statistic was investigated to determine if the new model (i.e., Model 3) was performing better than the previous model (i.e., Model 2). The statistically significant Chi-Square Test ($\chi^2 = 26.311, df = 3, p < .001$) suggests that Model 3 predicts if a case passed or failed the NCLEX–RN significantly better than Model 2. Next the *R*-statistic, the partial correlation between the outcome variable and each of the predictor variables, was considered. The Nagelkere's R^2 of Model 3 increased slightly to .185. As with the previous model the Hosmer and Lemeshow test was evaluated for statistical significance. The non-significant results ($\chi^2 = 3.861, df = 8, p =$

.869) indicate good model fit between the model and the data. These results suggest the predictors, as a set, reliably distinguished between participants who were successful on the NCLEX–RN and those who were not. From Table 15 individual coefficients, as hypothesized from the literature, were significant for a majority of the covariates.

Similar to previous proxy model (i.e., the Pell Grant Eligibility Model), the coefficients of ACT, College Generation, and their interaction (i.e., ACT x College Generation) were found to be non-significant. However, the interaction was probed to determine if the value of ACT related to NCLEX–RN varied amongst those who are and are not first-generation college students. From Table 16 participants who were not first-generation college students had a statistically significant moderation effect of ACT on NCLEX–RN, ($B = .2004$, $SE = .0418$; $z = 4.808$, $p = .001$). From Figure 9, as ACT scores increased, the probability of passing the NCLEX–RN for those who were not first-generation college students significantly increased. However, the opposite can be seen for those were first-generation students. That is, the effect of ACT on the NCLEX–RN is only significant for those who are not first-generation college students.

First-generation participants who, on average, earned an 18 on the ACT had an 84.0% chance of passing the NCLEX–RN compared to 82.0% for those who were not first-generation college students. However, the inverse is true for participants who had higher ACT scores. For instance, participants who were first-generation college students who, on average, earned 27 on the ACT had a 92.9% chance of passing the NCLEX–RN compared to 96.6% for those who were not first-generation college students. In other words, those who were first-generation college students had a non statistically significant

increase of 8.9% as ACT score increased compared to a statistically significant increase of 14.6% for those who were not first-generation college students. The values of 18 and 27 were selected as they represent the 10th and 90th percentile of ACT composite scores.

Table 15

College Generation

Variable	<i>B</i>	<i>SE</i>	<i>Z</i>	<i>95% CI</i>
Constant	-3.68	1.99	-1.84	-7.59, .24
Gender	.55	.24	2.25*	.07, 1.03
Age	-.08	.031	-2.57*	-.14, .02
Pre-admission GPA	-.54	.27	-2.01*	-1.06, -.01
College Science GPA	-.02	.28	-.06	-.56, .52
Final College GPA	2.03	.40	5.03***	1.24, 2.83
Program Type	1.22	.41	3.01**	.43, 2.03
ACT	.10	.07	1.46	-.03, .24
College Generation	-1.94	1.65	-1.17	-5.17, 1.29
College Generation X ACT	.10	.077	1.30	-.05, .25

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

Table 16

Conditional Effect of X on Y at Values of College Generation

Variable	<i>B</i>	<i>SE</i>	<i>z</i>	95% <i>CI</i>
First-Generation	.10	.07	1.46	-.03, .24
Non First-Generation	.20	.04	4.81***	.12, .28

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

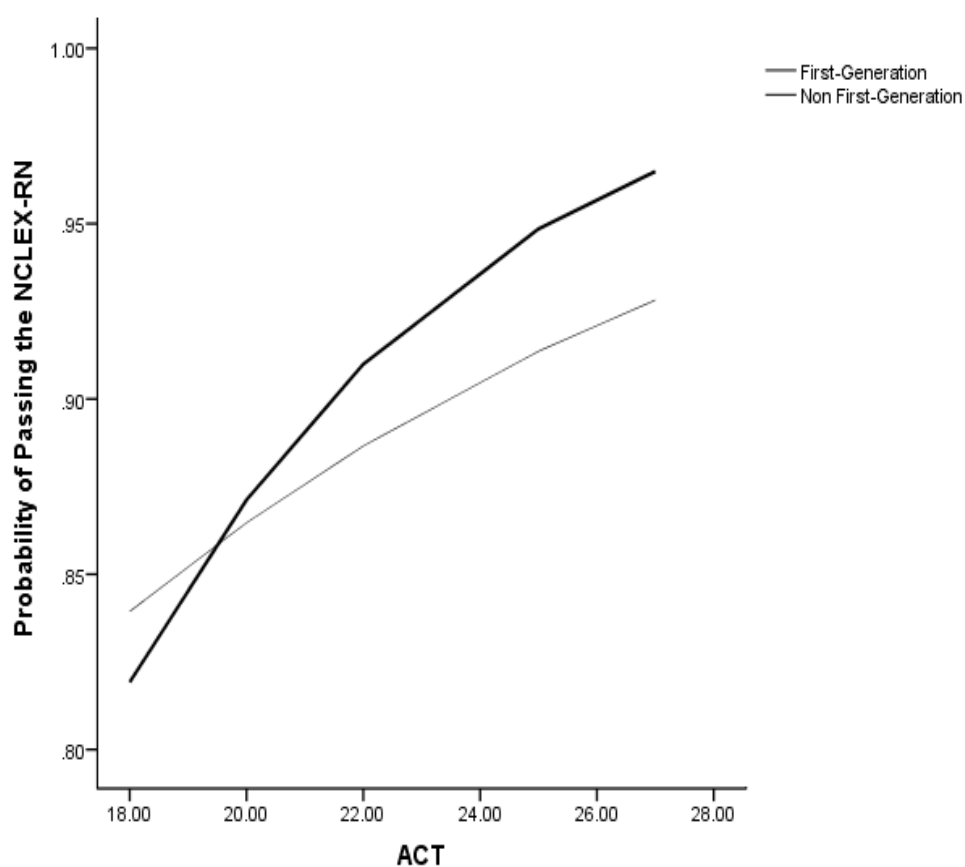


Figure 9. Conditional Effect of ACT on NCLEX–RN at values of College Generation. Note. Change in the slope of the line occurs at the 10th, 25th, 50th, 75th, and 90th, percentiles of ACT.

Moderator research question 3: Zip Code. The process outlined to evaluate Model 2 was followed to evaluate Model 3. ACT, Zip Code, and their interaction term were added to the model. The -2LL of Model 3 was assessed to determine its overall fit. The -2LL decreased by 25.598. Overall, Model 3 for Zip Code correctly classified 87.3% of cases and had a -2LL of 769.428. As with the previous models the Chi-Square statistic was investigated to determine if the new model (i.e., Model 3) was performing better than the previous model (i.e., Model 2). The statistically significant Chi-Square Test ($\chi^2 = 25.598, df = 5, p < .001$) suggests that Model 3 predicts if a case passed or failed the NCLEX–RN significantly better than Model 2. Next the *R*-statistic, the partial correlation between the outcome variable and each of the predictor variables, was considered. The Nagelkere's R^2 of Model 3 increased slightly to .184. As with the previous model the Hosmer and Lemeshow test was evaluated for statistical significance. The non-significant results ($\chi^2 = 3.226, df = 8, p = .919$) indicate good model fit between the model and the data. These results suggest the predictors, as a set, reliably distinguished between participants who were successful on the NCLEX–RN and those who were not. From Table 17 individual coefficients, as hypothesized from the literature, were significant for a majority of the covariates.

The coefficient for ACT ($B = .3251$) was significant ($SE = 1.3790; z = 2.5992, p = .0093$). However, Zip Code, and the interaction (i.e., ACT x Zip Code) were found to be non-significant. As with the previous models, the interaction was probed to determine if where the value of ACT related to NCLEX–RN varied amongst those from different zip codes. From Table 18, all three levels of the moderator were found to have

statistically significant moderation effects on the relationship of ACT on NCLEX–RN.

From Figure 10, as ACT scores increased, the probability of passing the NCLEX–RN for participants regardless of zip code significantly increased.

Table 17

Zip Code

Variable	<i>B</i>	<i>SE</i>	<i>Z</i>	<i>95% CI</i>
Constant	-5.49	2.02	-2.72	-9.44, -1.54
Gender	.56	.24	2.28*	.08, 1.04
Age	-.08	.03	-2.59*	-.14, -.02
Pre-admission GPA	-.55	.27	-2.07*	-1.07, -.03
College Science GPA	-.03	.28	-.09	-.57, .51
Final College GPA	2.07	.40	5.12***	1.28, 2.86
Program Type	1.25	.41	3.09**	.46, 2.05
MeanACT	.19	.07	2.60**	.05, .34
ZipCode	.33	1.38	.24	-2.38, 3.03
ZipCode X ACT	-.02	.06	-.23	-.14, .11

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

Table 18

Conditional Effect of X on Y at Values of Zip Code

Variable	<i>B</i>	<i>SE</i>	<i>z</i>	<i>95% CI</i>
Rural	.19	.07	2.60**	.04, .34
Urban	.18	.04	4.47***	.10, .25
Suburban	.16	.08	2.10*	.01, .31

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

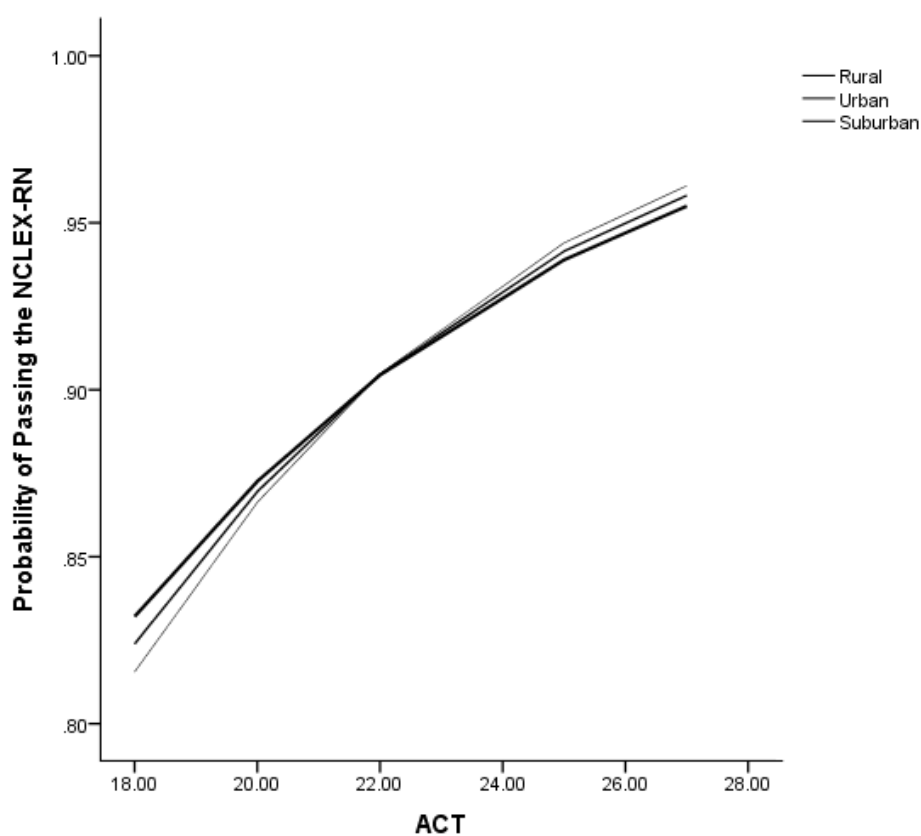


Figure 10. Conditional Effect of ACT on NCLEX–RN at values of Zip Code.
 Note. Change in the slope of the line occurs at the 10th, 25th, 50th, 75th, and 90th, percentiles of ACT.

Rural participants who, on average, earned an 18 on the ACT had an 81.6% chance of passing the NCLEX–RN compared to 82.4% and 83.2% for those who were urban or suburban participants, respectively. However, the inverse is true for participants who had higher ACT scores. For instance, participants who came from rural Zip Codes who, on average, earned 27 on the ACT had a 96.2% chance of passing the NCLEX–RN compared to 95.8% and 95.6% for those who were urban or suburban participants, respectively. That is, all participants, on average, regardless of zip code had a statistically significant increase in passing the NCLEX–RN as their ACT scores increased. The values of 18 and 27 were selected as they represent the 10th and 90th percentile of ACT composite scores.

These results indicate that Zip Code, as a proxy for SES, in a moderator model of ACT and NCLEX–RN results in a conditional effect regardless of the zip code classification. The obvious hypothesis to why Zip Code did not perform similar to the other proxies is the manner in which coding occurred. Though the census bureau has data for the percentage of each zip code that is rural, urban, and suburban, assigning the dominant category to a zip code may have resulted in a classification system that did not adequately separate participants based on SES. For example, labeling a zip code rural when only 51% of the Zip Code was actually rural may have resulted in mislabeling of certain cases. Only the five-digit Zip Code was available for study participants, making coding based on the nine digit Zip Code not possible.

Selection of the Moderator Proxy

Zip Code was ruled out as the best suited proxy for SES related to the coding concerns. As mentioned above, the limitation of the coding of Zip Codes may have resulted in the variable Zip Code not adequately separating participants based on SES. From Table 19, it can be argued that College Generation and Pell Grant Eligibility, in a moderation analysis with the sample analysis data, performed equally well as proxies for SES. The edge was given to College Generation for two reasons. As is outlined below, Pell Grant Eligibility was selected as the proxy for SES in the mediator model. Parsimony is essential in all statistical models. Using College Generation as the moderator results in one conditional effect instead of two, arguably a more parsimonious model. That is, using Pell Grant Eligibility as the primary predictor and moderator results in a conditional direct and indirect effect. However, using Pell Grant Eligibility as the primary predictor and College Generation as the moderator only results in a conditional indirect effect. Second, since Pell Grant Eligibility is dichotomous, a conditional process model where it is both the primary predictor and moderator is a misconstrued model, and is impossible to interpret. In other words, having two students who are the same on Pell Grant Eligibility, yet differ on Pell Grant Eligibility is not possible. The next section reviews the mediator research questions before describing the process used to evaluate each mediator model.

Table 19

Comparison of Pell Grant Eligibility and College Generation Moderation Models

Proxy	-2LL	Classification of Cases	χ^2	Nagelkere's R^2	Main Effect	Interaction Effect	Interaction at a Level of the Proxy
Pell Grant Eligibility	768.348	87.7%	$p = .881$.185	$p = .1047$	$p = .1044$	Yes
College Generation	768.715	87.7%	$p = .869$.185	$p = .2399$	$p = .1924$	Yes

Mediator Research Questions

Through logistic regression the following questions addressing the relationship between SES and NCLEX–RN and the hypothesized mediator ACT are investigated. ACT, as mentioned previously, is often considered one of the strongest predictors of NCLEX–RN. However, there is a debate in the literature whether ACT is truly a measure of knowledge or a product of SES. Through the following questions using the previously discussed proxies, the goal is to determine if the predictive power of ACT on the NCLEX–RN is stemming from the influence of SES on ACT. In other words, does ACT represent SES when predicting NCLEX–RN scores?

1. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using Estimated Family Contribution controlling for pre-admission GPA, college science GPA, final college GPA, gender, age, and program type?
2. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using College Generation controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?
3. Is the relationship between SES and NCLEX–RN scores mediated by ACT scores when SES is measured using Home Zip Code controlling for pre-admission GPA, college science GPA, final college GPA, age, gender, and program type?

Mediated Logistic Regression

PROCESS, the macro developed by Hayes (2013) for investigating moderation, mediation, and moderated mediation, along with binary logistic regression through SPSS (i.e., version 23), were used to determine the mediation effect. PROCESS Model 4 (refer to Figure 11) with the covariates was used to investigate if a mediation effect was prevalent with each of the proposed proxies of SES. To prevent redundancy, all statistical findings are done so with the understanding that covariates are under statistical control. Each model's direct, indirect, and total effects are reviewed in addition to the overall fit of the model. The coefficient of determination (R^2) for the consequent ACT model and the Nagelkere's R^2 for the consequent NCLEX–RN model were nearly identical in all three mediator models. Only in the Pell Grant mediator model, was the consequent ACT model found to be statistically significant. That is, Pell Grant was a statistically significant predictor of ACT and explained approximately 17% of the variance in ACT scores. As mentioned with the Moderator research questions previously, the Nagelkere's R^2 is analogous to the coefficient of determination with a dichotomous outcome variable (i.e., NCLEX–RN). The larger the Nagelkere's R^2 statistic, the more confident one can be the model fits the data. In all three mediator models, the Nagelkere's R^2 is just over .18. These values indicate appropriate model fit. Refer to each model summary table (i.e., Tables 20, 21, and 22 following the discussion of each research question) for model specific statistics.

As stated in Chapter 3, the Sobel Test (i.e., the Normal Theory Approach) is not recommended to test the significance of the indirect effect (i.e., ab). Alternatively, as no

assumptions are required and the increased power generated, the indirect effects for each model were tested for significance through the use of bias corrected Bootstrap Confidence Intervals. All three of the models (i.e., medication model for each proxy) are summarized below. Finally, decision on the preferred mediator is outlined.

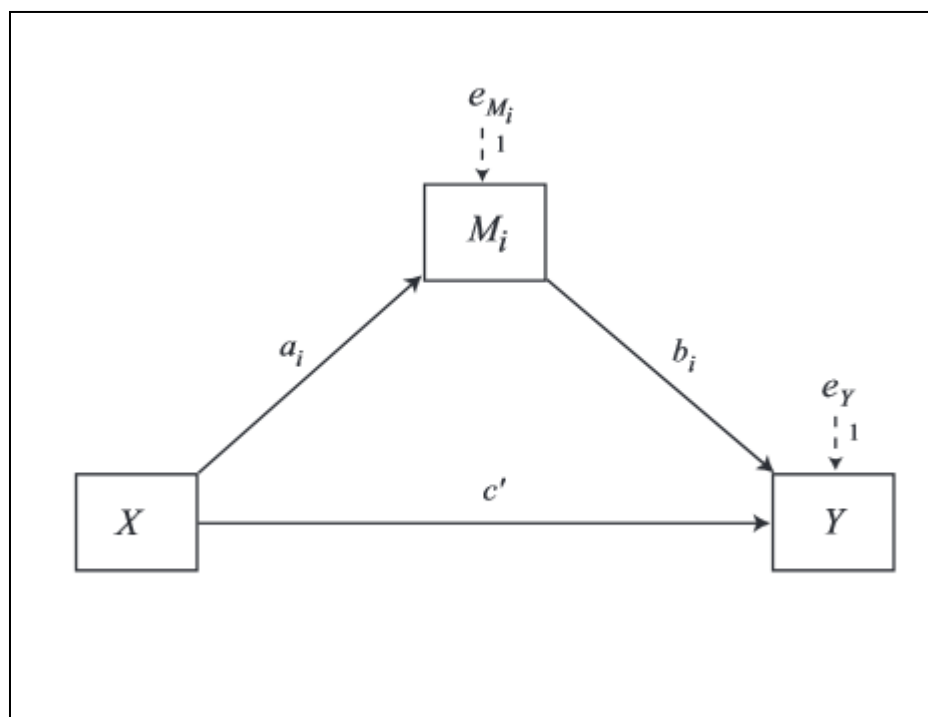


Figure 11. PROCESS Model 4. Indirect effect of X on Y through $M_i = a_i b_i$. Direct effect of X on $Y = c'$.

Mediator research question 4: Pell Grant. From Table 20 the significant a coefficient indicates that those that are Pell Grant Ineligible, on average, score .9419 units higher on the ACT than those who are Pell Grant Eligible. The significant regression coefficient for ACT, b , indicates that two participants with the same Pell Grant Eligibility who differ by one unit on the ACT are estimated to differ by .1774 units on the NCLEX–RN. In other words, the higher someone scores on the ACT the better they are projected to perform on the NCLEX–RN as long as they have the same Pell Grant Eligibility. The significant indirect effect ($ab = .1671$, $BootSE = .0532$, $BootCI = .0761$, $.2770$) indicates those who are Pell Grant Ineligible, relative to those that are Pell Grant Eligible, were, on average, .1671 units higher in likelihood of passing the NCLEX–RN as a result of their ACT score.

The non-significant direct effect ($c' = -.306$, $SE = .2029$, $z = -.1509$, $BootCI = -.4282$, $.3670$) of Pell Grant Eligibility on the likelihood of passing the NCLEX–RN suggests that Pell Grant only effects the NCLEX–RN through ACT. Furthermore, the non-significant total effect of .0499 ($SE = .1993$, $z = -.2506$, $BootCI = -.3407$, $.4406$) suggests that models negative direct effect is offsetting the positive indirect effect. The indirect effect was greater than the total effect making PM a non-meaningful measure of the effect size. As mentioned in Chapter 3, the other measures of effect size are not appropriate for models with covariates, dichotomous or categorical main predictors, or insufficient sample sizes. Overall, the model indicates there is no association between Pell Grant Eligibility and the NCLEX–RN independent of ACT effect on the NCLEX–RN; however, the effect size of this indirect effect cannot be quantified.

Table 20

Model Coefficients for Pell Grant Eligibility

Antecedent		Consequent							
		M (ACT)			Y (NCLEX–RN)				
		Coeff.	SE	<i>p</i>	Coeff.	SE	<i>p</i>		
<i>X</i> (PELL)	<i>a</i>	.9419	.2066	.000	<i>c'</i>	-.0306	.2029	.880	
<i>M</i> (ACT)		-	-	-	<i>b</i>	.1774	.0373	.000	
Constant	<i>i</i> ₁	21.7043	.1737	.000	<i>i</i> ₂	-5.1737	1.5411	.008	
		$R^2 = .174$ $F(1, 1174) = 20.7773, p < .001$			Nagelkere's $R^2 = .1814$				

Mediator research question 5: College Generation. Unlike the previous mediator model, this model, with College Generation as the main predictor, had non-significant direct, indirect, and total effects. From Table 21, the only significant coefficient was *b*. This significant regression coefficient for ACT indicates that two participants with the same College Generation who differ by one unit on the ACT are estimated to differ by .1773 units on the NCLEX–RN. That is, the higher someone scores on the ACT, the better they are projected to perform on the NCLEX–RN as long as they have the same College Generation. The indirect effect was smaller than the total effect however of a different sign making PM a non-meaningful measure of the effect size. As mentioned in Chapter 3, the other measures of effect size are not appropriate for models with covariates, dichotomous or categorical main predictors, or insufficient

sample sizes. Overall, the model indicates there is no association between College Generation and the NCLEX–RN independent or dependent of ACT effect on the NCLEX–RN.

Table 21

Model Coefficients for College Generation

Antecedent		Consequent						
		M (ACT)			Y (NCLEX–RN)			
		Coeff.	SE	<i>p</i>	Coeff.	SE	<i>p</i>	
<i>X</i> (GEN)	<i>a</i>	-.0548	.2405	.8199	<i>c'</i>	.1782	.2267	.4320
<i>M</i> (ACT)		-	-	-	<i>b</i>	.1773	.0372	.0000
Constant	<i>i</i> ₁	22.4141	.2160	.0000	<i>i</i> ₂	-5.3292	1.5481	.0006
<i>R</i> ² = .0000 <i>F</i> (1, 1174) = .0519, <i>p</i> = .8199				Nagelkere's <i>R</i> ² = .1823				

Note. Indirect Effect (*ab*) = -.0097 (*BootSE* = .0441, *BootCI* = -.1009, .0768). Total Effect = .1689 (*SE* = .2242, *z* = .7534, *BootCI* = -.2705, .6084)

Mediator research question 6: Zip Code. Similar to the College Generation Model, this model, with Zip Code as the main predictor, had non-significant direct, indirect, and total effects. From Table 22, the only significant coefficient was *b*. This significant regression coefficient for ACT indicates that two participants with the same Zip Code who differ by one unit on the ACT are estimated to differ by .1770 units on the NCLEX–RN. In other words, the higher someone scores on the ACT the better they are

projected to perform on the NCLEX–RN as long as they have the same Zip Code. The indirect effect was smaller than the total effect and of the same sign yielding a PM = .0256. So 2.56% of the effect of Zip Code on NCLEX–RN occurs indirectly through ACT. However, as noted previously, the total, direct, and indirect effects were not significant, making the interpretation of PM futile. As mentioned in Chapter 3, the other measures of effect size are not appropriate for models with covariates, dichotomous or categorical main predictors, or insufficient sample sizes. Overall, the model indicates there is no association between Zip Code and the NCLEX–RN independent or dependent of ACT effect on the NCLEX–RN.

Table 22

Model Coefficients for Zip Code

Antecedent		Consequent						
		M (ACT)			Y (NCLEX–RN)			
		Coeff.	SE	p	Coeff.	SE	p	
X (ZIP)	<i>a</i>	.0004	.1846	.9983	<i>c'</i>	.0144	.1788	.9360
M (ACT)		-	-	-	<i>b</i>	.1770	.0371	.0000
Constant	<i>i</i> ₁	22.3695	.2007	.0000	<i>i</i> ₂	-5.1963	1.5422	.0008
		R ² = .0000 F(1, 1174) = .0000, p = .9983			Nagelkere's R ² = .1814			

Note. Indirect Effect (*ab*) = .0001 (*BootSE* = .0326, *BootCI* = -.0721, .0634). Total Effect = .0039 (*SE* = .1783, *z* = .0217, *BootCI* = -.3456, .3533)

Selection of the Mediator Proxy

Of the three mediator models just outlined, only the Pell Grant Model, suggest that SES directly influences ACT scores. Additionally, only Pell Grant Eligibility, as a proxy for SES, was found to have a significant effect on NCLEX–RN. As mentioned above, this significant effect was the indirect effect, and occurred through the causal chain of Pell Grant Eligibility → ACT → NCLEX–RN. Unfortunately, the practical significance of this indirect effect cannot be quantified related to restrictions created by the model (i.e., covariates, dichotomous main predictors, and insufficient sample sizes). However, the statistical significance of this indirect effect, with the sample analysis data, suggest that Pell Grant Eligibility is the best suited proxy for SES in a mediation model and therefore was used in the Conditional Process Analysis.

Conditional Process Analysis

Up until now in this research study, mediation and moderation have been explored separately. PROCESS, the macro developed by Hayes (2013) for investigating moderation, mediation, and moderated mediation, along with binary logistic regression through SPSS (i.e., version 23), were used to determine the Moderated Mediation effect. In this section these two methods are combined to better understand the model of SES, ACT, and NCLEX–RN. As mentioned above, the relationship between ACT and the NCLEX–RN was found to be moderated for higher SES participants (i.e., participants were not first-generation; $B = .2004$, $SE = .0418$; $z = 4.808$, $p < .001$). Additionally, the indirect path in the mediation model (i.e., Pell Grant Eligibility = X , ACT = M , and NCLEX–RN = Y) was significant ($ab = .1671$, $BootSE = .0532$, $BootCI = .0761, .2770$).

Using PROCESS Model 14 (see Figure 12 and 13) with the covariates the findings of the mediation and moderation analysis were combined.

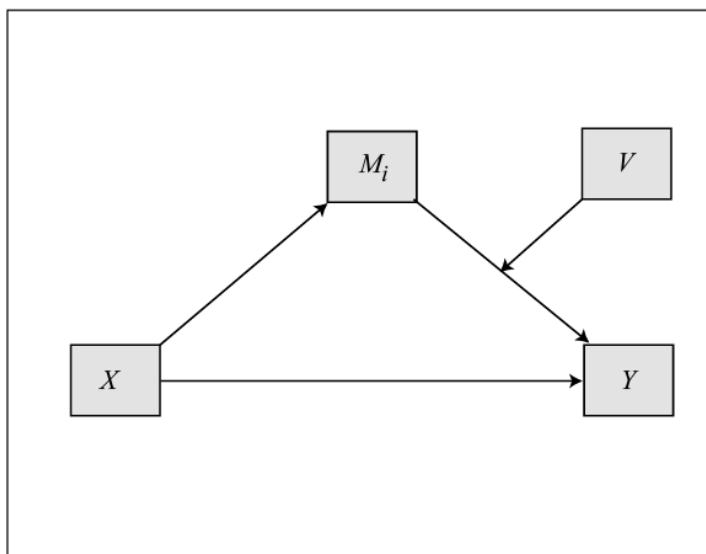


Figure 12. PROCESS Model14 – Conceptual Diagram.

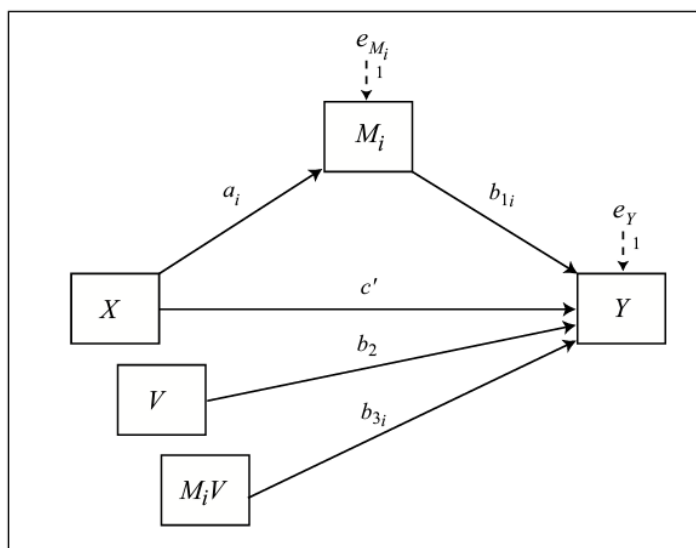


Figure 13. PROCESS Model14 – Statistical Diagram. Conditional indirect effect of X on Y through $M_i = a_i(b_{1i} + b_{3i}V)$ Direct effect of X on $Y = c'$.

From Table 23, the coefficient of determination (R^2) for the consequent ACT model and the Nagelkere's R^2 for the consequent NCLEX–RN model were similar to the simple mediation models discussed previously. The consequent ACT model is identical to the simple mediation model. That is, Pell Grant, as with the simple mediation model, remains a significant predictor of ACT and explains approximately 17% of the variance in ACT scores. For the consequent NCLEX–RN model the Nagelkere's R^2 was just over .18. These values indicate appropriate model fit. The significant a coefficient indicates that those that are Pell Grant Ineligible, on average, score .9419 units higher on the ACT than those who are Pell Grant Eligible.

Table 23

Model Coefficients for the Conditional Process Model

Antecedent		Consequent						
		M (ACT)			Y (NCLEX–RN)			
		Coeff.	SE	p	Coeff.	SE	p	
X (PELL)	a	.9419	.2066	.000	c'	-.0350	.2032	.8634
M (ACT)		-	-	-	b_1	.1014	.0690	.1415
V (Generation)		-	-	-	b_2	-1.9303	1.6511	.2424
$M \times V$		-	-	-	b_3	.0995	.0766	.1940
Constant	i_1	21.7043	.1737	.000	i_2	-3.6686	1.9972	.0662
$R^2 = .3062$				Nagelkere's $R^2 = .1847$				
$F(7, 1168) = 75.45, p < .001$								

Conditional Indirect Effects

To prevent redundancy, all direct and indirect effects discussed in the section are done so with the understanding that covariates are under statistical control. In the simple mediation model mentioned previously the indirect effect of Pell Grant Eligibility on NCLEX–RN through ACT was quantified as the effect of Pell Grant Eligibility on ACT multiplied by the effect of ACT on NCLEX–RN controlling for Pell Grant Eligibility (i.e., product of ab). In the conditional process model used here the conditional indirect effect of Pell Grant Eligibility on NCLEX–RN through ACT is quantified as the effect of Pell Grant Eligibility on ACT multiplied by the conditional effect of ACT on NCLEX–RN as a function of College Generation

Although the regression coefficient for ACT, the moderator, and their interaction were not significant, the conditional indirect effect was statistically significant for non first-generation students. As noted before, the indirect effect remains the product of the path from X to M (i.e., a) and the path from M to Y (i.e., $\theta_{M \rightarrow Y} = b_1 + b_3V$). In equation form the conditional indirect effect is $a\theta_{M \rightarrow Y} = a(b_1 + b_3V)$. The conditional indirect effect of Pell Grant Eligibility on NCLEX–RN through ACT conditioned on College Generation quantifies the amount by which two cases with a given value of College Generation (i.e., the same College Generation) but differ on Pell Grant Eligibility are estimated to differ on NCLEX–RN indirectly through Pell Grants Eligibility effect on ACT, which in turn influences NCLEX–RN.

From Table 24, the second column (i.e., a) is the effects of X on M . The third column is the conditional effect of M on Y . The fourth column (i.e., the product of the

second and third columns) is the conditional indirect effect of X on Y through M , conditioned on the values of V . The significant conditional indirect effect quantifies how differences in X map onto difference on Y , indirectly through M depending on the value of V . For example, two students who are not First-Generation but differ on Pell Grant Eligibility, the one who is not Pell Grant Eligible is estimated to be .1892 units higher in their likelihood of passing the NCLEX–RN.

Table 24

Conditional Indirect Effects of X on Y at Values of V

College Generation (V)	a	$\Theta_{M \rightarrow Y} = b_1 + b_3V$	$a\Theta_{M \rightarrow Y} = a(b_1 + b_3V)$	Boot SE	Boot CI
0 (First-Generation)	.9419	.1014	.0955	.0762	-.0302, .2681
1 (Not First-Generation)	.9419	.2009	.1892	.0420	.0874, .3100

Note. The conditional indirect effect between participants who are and are not first-generation was not found to be statistically significant (Index = .0937, Boot SE = .0804, Boot CI -.0611, .2569).

Direct and Total Effect

The interpretation of the direct effect from the simple mediation model discussed previously to the conditional process model used here is slightly different. In the simple mediation model the direct effect was interpreted as the effect of Pell Grant Eligibility on NCLEX–RN independent of Pell Grant Eligibility influence on NCLEX–RN through ACT. In the conditional process model the direct effect is interpreted as the effect of Pell Grant Eligibility on NCLEX–RN independent of Pell Grants Eligibility influence on

NCLEX–RN through ACT while holding College Generation constant. That is, the direct effect quantifies how much two participants that differ on Pell Grant Eligibility are estimated to differ on the NCLEX–RN when holding ACT and College Generation constant. The direct effect ($c' = -.0350$, $SE = .2032$, $p = .8634$) in this conditional process model was non-significant. The total effect in a conditional process model varies depending on the condition, and therefore is not constant and therefore was not calculated or reported.

CHAPTER V

DISCUSSION

In this chapter, a summary of the sample, analysis sample data, and the methods used are detailed. The implications and limitations of each moderator and mediator model are presented separately, before discussing the findings of the conditional process model. Finally, future directions of research that follows this study are suggested.

Summary of the Data

The summary of the descriptive and demographic data is discussed prior to the substantive findings. The initial sample was collected from a large Midwestern University and included eligible College of Nursing graduates from Fall 2010 through Spring 2015. Only participants with complete data for the key variables (i.e., NCLEX–RN, ACT Composite, and all four potential proxies for SES) were included. Of the 1,176 eligible participants, nearly a quarter had missing data. Through recoding and statistical methods it was determined that participants with and without missing data were statistically different. Participants were found to differ on two categorical variables (i.e., Program Type, and College Generation) and four continuous variables (i.e., Age, Pre-admission GPA, Final College GPA, and ACT composite). Based on these findings, data estimation was explored.

Considering the large amount missing data were found not to be missing completely at random, multiple imputation through the missing values add on in SPSS was performed. Results comparing the imputed data to the original data suggested that

the two groups were not statistically different, and therefore the imputed data were used as the final analysis data.

The demographic and descriptive statistics of the final analysis data are discussed here. As was expected, the sample was a little over three quarters female. The average age was 24, which is typical for new graduates of an undergraduate nursing program. Furthermore, a little more than two thirds of participants were under the average age of 24, with a small proportion being 35 years old or older. A majority of the sample self-identified as Caucasian whereas a minority of the sample self-identified as Asian. Whereas greater than the numbers of self-identified Asians, less than 6% of participants self-identified as other minorities.

The sample first time pass rate on the NCLEX–RN was just over 87%. The average ACT composite was approximately 22 and varied from the low teens to the mid-30s. Approximately one third of the sample were Pell Grant eligible. Even a smaller minority of the participants were first-generation college students. Nearly three fourths of the sample were from urban areas. The remainder of the participants were from rural or suburban zip codes. Just over a tenth of the graduates were accelerated students, with a large majority of students being graduates of the traditional four-year program. The average GPAs of participants for all three categories of GPA (i.e., Pre-admission, College science, and Final College) were between 3.30 and 3.45.

The next section is a synopsis of the substantive findings from this study, with special attention being giving to each model. The moderator models are discussed separately from the mediator models. Rationale and support for the hypothesized proxy

of SES selected in moderation and mediation separately are argued. Finally, the conditional process analysis with the selected proxies of SES is reviewed.

Moderator Models

Through logistic regression with the use of six covariates, the relationship between ACT scores the NCLEX–RN outcomes and the hypothesized moderator of SES were investigated. Three appropriate proxies for SES were tested for moderation. The goal of these research questions was to determine if SES is indeed a moderator of the relationship between ACT and NCLEX–RN and if so, which of the proposed proxies (i.e., Pell Grant Eligibility, College Generation, or Zip Code) best demonstrates this moderator effect.

Pell Grant

The Pell Grant Moderation model was found to correctly classify just over 87% of cases. The overall model was deemed appropriate for these data. A majority of the covariates (i.e., five of six) were found to be substantial predictors of NCLEX–RN. However, ACT, Pell Grant Eligibility, and their interaction (i.e., ACT x Pell Grant Eligibility) were not found to be important predictors. However, the interaction was explored and it was found that the value of ACT related to NCLEX–RN varied amongst those who are and are not eligible for Pell Grants. Participants who were not eligible for a Pell Grant had a noteworthy moderation effect on the relationship between ACT and the NCLEX–RN. As ACT scores increased, the probability of passing the NCLEX–RN for those who were Pell Grant eligible also increased, but was not significant. That is, the

effect of ACT on the NCLEX–RN was only significant for those who are not eligible for a Pell Grant.

Pell Grant Eligible participants who, on average, earned an 18 on the ACT had nearly a 5% better chance of passing the NCLEX–RN to those who were Pell Grant Ineligible. However, the inverse is true for participants who had higher ACT scores. For example, participants who were Pell Grant Eligible who, on average, earned 27 on the ACT had approximately 3% decrease in their probability of passing the NCLEX–RN compared to those who were Pell Grant Ineligible. In other words, those who were Pell Grant Eligible had a non-substantial increase of 8.7% as ACT score increased compared to a significant increase of 16.3% for those who were Pell Grant Ineligible.

These results indicate what CAPSES, the conceptual framework discussed in Chapter 1, suggested. Higher SES status participants (i.e., Pell Grant Ineligible) are more likely to have the Capital to overcome lower ACT scores, whereas the opposite is true for lower SES students. The two-fold increase in the likelihood of passing the NCLEX–RN of participants not eligible for the Pell Grant compared to those who are Pell Grant Eligible exemplifies the importance of financial resources, personal knowledge, and connections when navigating through higher education. As Pell Grant Eligibility was hypothesized to function as Material Capital, these findings emphasize the importance of sufficient financial resources when navigating higher education.

College Generation

The College Generation Moderation model was also found to correctly classify just over 87% of cases. Once again, the model was deemed appropriate for these data.

As with the Pell Grant Model five of the six covariates were noteworthy predictors of the NCLEX–RN. However, once again, the coefficients of ACT, College Generation, and their interaction (i.e., ACT x College Generation) were found to be insignificant. However, the interaction was investigated to determine if the value of ACT related to NCLEX–RN varied amongst those who are and are not first-generation college students. It was found that as ACT scores increased, the probability of passing the NCLEX–RN for those who were not first-generation college students substantially increased. In other words, the effect of ACT on the NCLEX–RN is only significant for those who are not first-generation college students.

First-generation participants who, on average, earned an 18 on the ACT had a 2% better chance of passing the NCLEX–RN compared to those who were not first-generation college students. However, the opposite was found for participants who had higher ACT scores. For instance, participants who were first-generation college students who, on average, earned 27 on the ACT had almost a 4% lesser chance of passing the NCLEX–RN compared to those who were not first-generation college students. Participants who were first-generation college students had a trivial increase of 8.9% as ACT score increased compared to a momentous increase of 14.6% for those who were not first-generation college students.

Once again the CAPSES conceptual framework supports these findings. Higher SES status participants tend to have the resources to overcome poor ACT scores, whereas the opposite is true for lower SES students. The noticeable increase in the likelihood of passing the NCLEX–RN of non first-generation participants compared to those who are

first-generation exemplifies the importance financial resources, personal knowledge, and connections when navigating through higher education. As College Generation was hypothesized to function as Human Capital, these findings emphasize the importance of knowledge and skills to navigate higher education.

Zip Code

The Zip Code model was found to correctly classify approximately 87% of the cases. Although slight, the classification for the Zip Code Model was lower than the previous two models by four tenths of a percent. The overall model fit between the model and the data was once again sufficient. As was expected, the individual coefficients were substantial for a majority of the covariates.

Unlike the previous two moderator models, the coefficient for ACT was significant in the Zip Code moderator model. However, Zip Code and the interaction (i.e., ACT x Zip Code) were found to be not significant. As with the previous models, the interaction was probed to determine if the value of ACT related to NCLEX–RN varied amongst those from different zip codes. Moderation was present at all three levels of Zip Code (i.e., rural, urban, and suburban). As ACT scores increased, the probability of passing the NCLEX–RN for participants regardless of zip code considerably increased. There was only a slight variation in the probability of passing the NCLEX–RN in participants who had similar ACT scores in relation to their Zip Code. Interestingly, all participants, on average, regardless of Zip Code had a statistically significant increase in their probability of passing the NCLEX–RN as their ACT scores increased.

These results indicate that Zip Code, as a proxy for SES, in a moderation model of ACT and NCLEX–RN yields a conditional effect regardless of the zip code classification. This finding is unique when compared to the previous two models. One obvious hypothesis as to why Zip Code did not perform similar to the other proxies is the manner in which coding occurred. Though the census bureau has data for the percentage of each zip code that is rural, urban, and suburban, assigning the dominant category to a zip code may have resulted in a classification system that did not adequately separate participants based on SES. For example, labeling a zip code rural when only 51% of the Zip Codes were actually rural may have resulted in mislabeling of certain cases. Only the five digit Zip Code was available for study participants, making coding based on the nine digit Zip Code not possible.

Thus, the Zip Code moderator model does not support nor refute the claims of the CAPSES. Social capital was hypothesized to be represented by Zip Code. It may be that social and community ties (i.e., Social Capital) are not as influential as the Material and Human Capital for this population. However, the literature suggests that each of the capitals is similar, depending on the situation, in importance (e.g., Coleman, 1988; Oakes & Rossi, 2003; Walpole, 2003). It is more likely that the potential coding issue discussed above is resulting in these findings. Thus, substantive inferences should not be hypothesized from the Zip Code Model. These non-conclusive findings suggest that a more precise measure of SES in the community and therefore of Social Capital should be addressed in future research.

Moderator Conclusion

Both the Pell Grant Model and the College Generation model suggest that students with higher SES are significantly more likely to be successful on the NCLEX–RN as ACT scores increase. Whereas these findings are inconclusive beyond this current study, these findings support the well-documented relationship between SES and higher education success (e.g., Heisserer & Parette, 2002; O’Keeffe, 2013). However, this study takes this relationship beyond higher education to a national standardized test, the NCLEX–RN. These findings signify the importance of SES once a student is in higher education. The access to resources, both personal and financial, seems to be important for first time success on the NCLEX–RN (Strayhorn, 2009; Walpole, 2003).

Mediator Models

Through logistic regression, and the use of six covariates, the relationship between SES and NCLEX–RN, and the hypothesized mediator ACT was investigated. The goal of the mediator research questions was to determine if the predictive power of ACT on the NCLEX–RN is stemming from the influence of SES on ACT. In other words, does ACT embody SES when predicting NCLEX–RN scores?

Pell Grant

The Pell Grant Mediation Model indicates that participants who were not eligible for Pell Grants, on average, scored higher on the ACT than those who are Pell Grant Eligible. Furthermore the model suggests the higher someone scores on the ACT the better they are projected to perform on the NCLEX–RN as long as they have the same Pell Grant Eligibility. Finally, the substantial indirect effect specifies those who are Pell

Grant Ineligible, relative to those who are Pell Grant Eligible, on average, have an increased likelihood of passing the NCLEX–RN as a result of their ACT score.

The direct effect and the total effect were not found to be meaningful. The lack of a direct effect indicates that Pell Grant only effects the NCLEX–RN through ACT. Overall, the model suggests that there is no association between Pell Grant Eligibility and the NCLEX–RN independent of ACT effect on the NCLEX–RN. The findings are similar to previous research with higher education success (Sackett et al., 2009). The effect size of this indirect effect cannot be quantified, as an appropriate measure of effect size, in the case of this data does not exist. This finding suggests that ACT may be representing SES when predicting NCLEX–RN outcomes.

College Generation

Unlike the previous mediator model, this model with College Generation as the main predictor had no significant direct, indirect, and total effects. The only noteworthy regression coefficient was for ACT, and suggests the higher someone scores on the ACT the better they are projected to perform on the NCLEX–RN as long as they have the same College Generation. Overall, the model indicates there is no association between College Generation and the NCLEX–RN independent or dependent of ACT effect on the NCLEX–RN.

Zip Code

Similar to the College Generation Model, the model, with Zip Code as the main predictor, had non-significant direct, indirect, and total effects. As with the College Generation model, the only noteworthy coefficient was for ACT, which indicates the

higher someone scores on the ACT the better they are projected to perform on the NCLEX–RN as long as they have the same Zip Code. Overall, the model indicates there is no association between Zip Code and the NCLEX–RN independent or dependent of ACT effect on the NCLEX–RN.

Mediator Conclusion

The findings of the mediation model fully support that ACT is a predictor of the NCLEX–RN regardless of the model. The conditional indirect effects found for the Pell Grant model suggest that ACT may represent SES. In other words, the degree to which ACT represents SES varies amongst levels of SES. Higher SES students are projected to perform better on the NCLEX–RN as a result of ACT scores. This conditional indirect effect of SES on the NCLEX–RN through ACT further supports the claim that ACT may be a measure of SES and not just of cognitive ability (Biernat, 2003; Crosby et al., 2003; Kohn, 2001; Zwick, 2004).

Conditional Process Model

In this section the outcome of Moderated Mediation (i.e., the Conditional Process Model) is discussed. As mentioned above, the relationship between ACT and the NCLEX–RN was found to be moderated for higher SES participants in the College Generation Model. Additionally, the indirect path in the Pell Grant mediation model was found to be statistically significant. Based on these findings Pell Grant Eligibility was used as the main predictor, ACT was inserted as the Mediator, and College Generation was proposed as the moderator between ACT and the outcome variable, NCLEX–RN.

In the Conditional Process Model, Pell Grant was found to be a significant predictor of ACT and explained approximately 20% of the variance in ACT scores. This significant coefficient indicates that those who are not eligible for a Pell Grant, on average, perform better on the ACT than those who are Pell Grant Eligible. The consequent NCLEX–RN model was found to have appropriate model fit.

The regression coefficients for ACT, College Generation, and their interaction were not substantial. However, the conditional indirect effect was noteworthy for non first-generation students. The conditional indirect effect of Pell Grant Eligibility on NCLEX–RN through ACT conditioned on College Generation quantifies the amount by which two cases with a given value of College Generation (i.e., the same College Generation) but differ on Pell Grant Eligibility are estimated to differ on NCLEX–RN indirectly through Pell Grants Eligibility effect on ACT, which in turn influences NCLEX–RN. For example, two students who are not first-generation but differ on Pell Grant Eligibility, the one who is Pell Grant Ineligible is estimated to be higher in their likelihood of passing the NCLEX–RN. The direct effect in the conditional process model was not substantial. The total effect in a conditional process model varies depending on the condition, and therefore is not constant and therefore was not calculated or reported.

Conditional Process Conclusion

Combing the knowledge gained through the moderation and mediation models, it can be hypothesized that SES (i.e., depending on its measurement) is vital to being successful on the ACT and the NCLEX–RN. Students with higher SES status (i.e., Pell Grant Ineligibility) had significantly higher ACT scores. Additionally, if a student

struggled on the ACT having a higher SES (i.e., not first College Generation) allowed the student to have an increased chance of passing the NCLEX–RN.

The Conditional Process model further supports this hypothesis. For example in comparing two students who are not first-generation but differ on Pell Grant Eligibility, the student who is Pell Grant Ineligible has an increased likelihood of passing the NCLEX–RN. However, for two students who are first-generation but differ on Pell Grant Eligibility, the student who is Pell Grant Ineligible does not have an increase in the likelihood of passing the NCLEX–RN. In other words, two students who have high SES, the one who has the highest has a better chance of passing the NCLEX–RN. However, two students who are lower SES, the one that is higher does not have an increased chance of passing the NCLEX–RN.

In an attempt to conceptualize the above findings, participants were coded into four different groups (refer to Table 25). Group one can be labeled High SES and would include those participants who are Pell Grant Ineligible and not first-generation. Group two can be labeled Low SES and would include those participants who are Pell Grant Eligible and first-generation. The remaining two groups (i.e., Group three and Group four) would then be comprised of a combination of participants who fall into one high SES classification and one low SES classification. For labeling sake, Group three would include participants who are first-generation but Pell Grant Ineligible. Group four would include participants who are not first-generation but are Pell Grant Eligible. Both Groups three and four could be labeled Moderate SES.

The Conditional Process Model compared Group one to Group four (i.e., High SES to Moderate SES) and Group two to Group three (i.e., Low SES to Moderate SES). The results suggest that there is a significant difference between the High SES and Moderate SES students; however, there is not a significant difference between Moderate and Low SES students. Extrapolating these results, the High SES students have an increased likelihood passing the NCLEX–RN compared to all other participants. Furthermore, being Pell Grant Eligible or first-generation markedly decreases a participant’s likelihood of passing the NCLEX–RN.

Table 25

Classification of Participants Based on SES

Group 1 (High SES)	Group 2 (Low SES)	Group 3 (Moderate SES)	Group 4 (Moderate SES)
Pell Grant Ineligible	Pell Grant Eligible	Pell Grant Ineligible	Pell Grant Eligible
Not First-Generation	First-Generation	First-Generation	Not First-Generation

Implications

These findings suggest that there is a benefit to having a higher SES related to being successful on the first attempt on the NCLEX–RN. This result is not surprising as CAPSES suggests that the more Material Capital, Human Capital, and Social Capital (i.e., having a higher SES) an individual possesses, the more successful he or she will be

in higher education. There is an economic gap relative to academic success in higher education (e.g., Strayhorn, 2009; Walpole, 2003). It appears, based on the results of this research study, that this economic gap is also present for nursing academic outcomes such as success on the NCLEX–RN.

Results show that two of the proposed proxies of SES are influential in the relationship between ACT, NCLEX–RN, and the covariates. In this section, the implications for stakeholders such as students, parents, faculty, administrators, and the nursing community as a whole are discussed. In addition to the implications, the modalities which can be implemented to overcome the economic gap are suggested.

Implications for Students and Parents

The findings of this study are of interest to students and their parents, as they are the primary and most proximally positioned stakeholders (Juraschek et al., 2012). The education gap driven by SES has been demonstrated in this study to have an impact on NCLEX–RN outcomes. Being that the findings are similar to higher education in general, the importance of disseminating these findings to students and their parents is crucial. Motility between levels of SES is challenging; however, apprising lower SES students and their parents of the results from this research study may allow them to prepare for the additional challenges.

Disseminating this information to students and parents may not be enough. For example, since 1960 it has been found that grades at universities have markedly increased (i.e., grade inflation; Babcock, 2010; Jewell, McPherson, & Tieslau, 2013). As one example, the presence of grade inflation in higher education may result in an unwarranted

increased sense of self by students (Kruger & Dunning, 1999). Before students can be expected to take steps to become successful, they must have an accurate self-assessment. Many students have difficulties in recognizing their own inabilities that lead to inflated sense of self and higher education abilities (Kruger & Dunning, 1999). Lower SES students, as discussed previously, do not often have the same skills to overcome an inaccurate self-assessment. Therefore, it is suggested that students, early in their nursing programs perform an accurate self-assessment. Once a student has an actual sense of self, programs that focus on techniques that promote self-regulation and essential skill development becomes more likely.

Implications for Faculty and Administrators

Unlike students, faculty and administrators have accurate knowledge of a student's abilities. As discussed in Chapter 2, having students who are successful on the first attempt on the NCLEX–RN is essential for nursing programs. High pass rates are required by national and state organizations (ACEN, 2013; CCNE, 2013). The findings of the current study indicate that nursing programs need to be proactive in addressing the education gap between different levels of SES. In the literature, there appears to be two general approaches to addressing the educational gap, increased support and more structured education (Summers & Hrabowski, 2006; Tekian & Hruska, 2004). Both of these techniques are briefly elucidated in the next two paragraphs.

Higher education programs that have demonstrated a decrease in the educational gap between low and high level SES often are able to do so with increased funding (Summers & Hrabowski, 2006; Tekian & Hruska, 2004). Securing funding to provide

financial aid, supplementary instruction, mentoring, and social support (if feasible) is recommended. Besides being supported by the literature, these techniques corroborate the CAPSES that lower SES students are often missing (i.e., increasing Material Capital, Human Capital, and Social Capital).

More recently, the literature has focused on less financial straining modalities to decrease the SES driven education gap (Pennebaker et al., 2013). For instance, frequent testing (i.e., daily testing) along with immediate and structured feedback has been found to boost college performance and reduce the achievement gap in both the class where it is being implemented and during future semesters. Furthermore, classes with increased structure and that implore active learning have been demonstrated to reduce the achievement gap between different levels of SES (Haak, HilleRisLambers, Pitre, & Freeman, 2011). These techniques, whereas beneficial in all college courses, offer the most benefit if implemented early in the students higher education experience (i.e., first or second semester).

Implication for the Nursing Community

The implications for the nursing research community are vast and of high importance. As was explained in Chapter 2, there is a deficiency of literature focusing on SES and NCLEX–RN outcomes. This study contributes to the literature by suggesting that SES’s influence on NCLEX–RN outcomes occurs through moderated mediation. At minimal, this exploratory research study provides the basis to suggest similar and more in-depth studies are needed to understand the educational gap created by SES on NCLEX–RN outcomes.

Research that validates these findings is needed. Furthermore, depending on the validation evidence, early alerts, mentoring, and other policies need to be implemented to ensure diversity in the nursing profession. Nurses from similar backgrounds as their patients often see increased patient satisfaction and outcomes (Yoost & Crawford, 2015). Furthermore, promoting success of all students in nursing should result in a regression towards the mean for future generations. In other words, the conditional effect of SES should start to minimize as the education gap created by SES is corrected.

There is minimal research focusing on the NCLEX–RN scores using mediation and/or moderation as the focus. Most importantly, no literature was found outlining a conditional process model with SES, ACT scores, and NCLEX–RN scores as the focus. Advanced models (i.e., conditional process models) involving the NCLEX–RN are necessary as the stakeholders discussed previously have a vested interest in understanding the complexity affecting the outcomes of this high-stakes test. A more detailed and global understating of the NCLEX–RN will drive curricular decisions.

Limitations and Future Directions

In this section the limitations and future directions are divided into three related yet different areas. The specific limitation of the methodology implored, measurement techniques, and the statistical methods are discussed. Additionally, future directions in each one of these areas are suggested.

Methodological Limitations and Future Directions

Due to the design of this study, a retrospective cross-sectional analysis, the result may have limited generalizability beyond the sample and the institution where the sample

was collected (Tabachnick & Fidell, 2013). This research is cross-sectional and not experimental; therefore determining the causal order of relationship is not possible (Hayes, 2013). Furthermore, the narrow inclusion criteria for participant eligibility results in decreased generalizability (Lomax & Hahs-Vaughn, 2012). Future studies should have less specific inclusion criteria and be of multiple site design. Additionally, studies in different regions of the US are warranted.

Measurement-Related Limitations and Future Directions

Though the literature suggested measurement of the hypothesized proxies of SES, actual sample data used created measurement issues with three of the four hypothesized proxies. The manner in which Race was measured created a 93.1% Caucasian, 5.7% Black, Native American, Alaskan Native, or Hispanic, and 1.2% Asian split, which prevented its use inferentially. This limitation prevented the investigation of one of the four hypothesized proxies for SES. Whereas the findings of the study suggest that moderation, mediation, and moderated mediation are present in the relationship between SES, ACT, and the NCLEX–RN, the inclusion of student Race may add further support to these findings. A sample more indicative of the national population would allow for inferential statistics using Race as a proxy for SES.

The measurement of another one of the proxies may have prevented a moderation or mediation effect from being found in the analysis sample data. As touched on above, only the five-digit Zip Code was available for study participants, making coding based on the nine digit Zip Code not possible. Because participants were grouped together based on the five digit Zip Code, misclassification is of concern. A sample where the nine digit

Zip Code is used would likely resolve the misclassification issue that occurred in this research study.

The literature suggests that estimated family contribution, as discussed in Chapter 2, be used for a proxy for SES. Pell Grant Eligibility is also considered an accepted proxy of SES, and is based on estimated family contribution. However, power was probably lost as estimated family contribution is a continuous variable and Pell Grant Eligibility is a dichotomous variable (Rhemtulla et al., 2012). The use of estimated family contribution in future studies would likely give a clear and more meaningful picture of how SES functions in a moderation, mediation, and moderated mediation with ACT and NCLEX–RN.

Whereas the proxies for SES selected represent the most common indicators, they were not comprehensive measures of SES. Measurement of SES that combines numerous variables in a composite manner may yield different findings (ASHE, 2007). It is suggested that future studies be designed to include composite measures of SES.

Statistical Limitation and Future Directions

The first statistical limitation is the missing data in the original sample. Approximately one quarter of the cases contained missing data. Although, appropriate rigor and methods were used to estimate the missing data, substantial amounts of the data were still estimated. Whereas confidence can be given related to the findings of this study, future studies without missing data are suggested (Tabachnick & Fidell, 2013).

The lack of a direct effect in the mediation models and the conditional process model warrants a brief discussion. According to Hayes (2013), it is appropriate to

conduct a mediation analysis even if one cannot clearly establish causality given the limitations of one's data collection and research design. In this research study, this situation is hypothesized to be present. However, the literature is sufficient to support the causal claim that SES has an influence on the higher education outcomes (Heisserer & Parette, 2002; O'Keeffe, 2013). Furthermore, it should be noted that lack of correlation does not disprove causation and correlation is neither necessary nor a sufficient condition of causality (Hayes, 2013). Finally, the literature makes similar claims with the influence of SES on higher education grades as mediated by ACT/SAT scores. The literature suggests that "SES had a near-zero relationship with grades other than through this SES-test [ACT/SAT]-grade [higher education grade] chain of relationship" (Sackett et al., 2009, p. 17).

The indirect effect size of the significant mediation model (i.e., Pell Grant Model) is not quantifiable. This is related to incorporation of covariates, a dichotomous predictor, the sample size, and the sign and size of the direct, indirect, and total effects. A larger sample size and using estimate family contribution instead of Pell Grant Eligibility in future studies would allow for quantification of the indirect effect size.

Conclusion

Research has shown that lower SESs are at a disadvantage related to higher education (Heisserer & Parette, 2002; O'Keeffe, 2013). Additionally, ACT is used by the NCSBN (2015a) as a form of predictive validity for NCLEX–RN outcomes. The current study aimed to add to the limited body of theoretical and empirical literature examining the relationship between SES, ACT, and the NCLEX–RN through retrospective cross-

sectional analysis while applying advanced statistical methods. Results of this study highlighted a moderated mediation relationship between SES and the NCLEX–RN. Whereas there was no direct effect found on NCLEX–RN from SES, the conditional indirect effect of SES to ACT to NCLEX–RN was found to be important. The effect indicates that SES significantly influences ACT scores which significantly influences NCLEX–RN scores conditionally on the SES. The higher one’s SES, the better probability he or she has of passing the NCLEX–RN.

For successful completion of the NCLEX–RN, for moderate and low SES students, it is important that students, parents, faculty, and administrators present a unified front. However, the exact techniques that make low SES students successful on the NCLEX–RN may vary and warrants further investigation. The results from this study provide valuable cautionary information about the impact of SES influence on the NCLEX–RN.

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