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THE IMPACT OF REMEDIAL EDUCATION ON NURSING

STUDENT SUCCESS

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**ABSTRACT**

The purpose of this study was to examine the impact of remedial education on nursing student success. This quantitative, retrospective study utilized Alexander Astin's (1993) Input-Environment-Outcomes (I-E-O) model to explore the relationship between demographic variables (inputs) and the number and type of remedial courses taken (environmental variables) on final cumulative grade point average (GPA) and first-time pass rates on the NCLEX-RN state licensure examination (outcomes). The study examined 1,678 associate degree nursing (ADN) graduates between 2004 and 2007 in a state-wide community college system. The analysis identified MAT 050/Basic Algebra as the only remedial course to have the statistical power to be included in the model as a predictor of final cumulative GPA. However, the model only accounted for .4% of the variance indicating there are other factors influencing students' GPA besides the MAT 050 course. Results suggest that female students are less likely to need remediation in ENG 032/Reading Strategies for College II and more likely to need remediation in MAT 050/Basic Algebra. Ethnicity and age were found to be weak predictors of final cumulative GPA and pass/fail performance on the NCLEX-RN examination. Number and type of remedial courses showed no statistically significant, predictive relationships with pass/fail rates on the NCLEX-RN examination. Understanding the impact of remedial education on nursing student success can ultimately influence the number of nurses available to meet the needs of an aging population.

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## CHAPTER 1

### **Introduction**

Community colleges continue to serve a high volume of minority, low-income, and first-generation students who enter college with inadequate preparation (Grimes & David, 1999). For those seeking degrees in nursing, competition is high for the limited number of seats in selective admission programs. Pre-admission academic screening in English and mathematics can result in student placement in one or more remedial education classes which must be successfully completed before admission into nursing programs. Understanding the impact of remedial education on nursing student success supports effective recruitment, guides the development of effective remedial education programs, has a positive effect on attrition, affects the number of nurses available to meet the needs of an aging population, and increases the pool of associate degree graduates available to enroll in advanced degree nursing programs.

This quantitative, retrospective study utilized Alexander Astin's (1993) Input-Environment-Outcomes (I-E-O) model to explore the relationship between demographic variables (inputs) and the number and type of remedial classes taken (environmental variables) on final cumulative grade point average (GPA) and first-time pass rates on the state licensure examination (outcomes) for associate degree nursing (ADN) graduates from 2004-2007. Archival data came from Indiana's Ivy Tech Community College (Ivy Tech), a statewide community college system consisting of 14 regions and 23 primary campuses. Based on Astin's

model, input variables or student characteristics of age, gender, and ethnicity were included in the regression analysis as covariates in order to hold them statistically constant.

For the purpose of this study, the term *remedial* was used to denote the typical noncredit classes to which entering students are assigned on the basis of low scores on placement tests such as the Computerized Adaptive Placement Assessment and Support Systems (COMPASS) and the Assessment of Skills for Successful Entry and Transfer (ASSET). Remedial courses included in the study were: two courses in reading (ENG 031 Reading Strategies for College I and ENG 032 Reading Strategies for College II); two writing courses (ENG 024 Introduction to College Writing I and ENG 025 Introduction to College Writing II); and two levels of remedial mathematics (MAT 044 Mathematics and MAT 050 Basic Algebra). Taking remedial courses can be an additional barrier for those seeking admission into nursing programs. With many underprepared students entering community college systems, examining the impact of remedial education on nursing student achievement is necessary in facilitating student success.

## **Background**

Addressing the increasing shortage of nurses in Indiana and across the United States is critical to ensuring adequate healthcare for all citizens. As professional opportunities for women have increased, fewer young adults are entering the nursing profession (Drury, Francis, & Chapman, 2008). With an aging baby boomer population and an aging nurse educator population, there is the potential for health education programs to contribute to the healthcare workforce in Indiana. For healthcare and nursing education, an impending challenge in meeting the healthcare needs now and in the future is evident making it important to determine what variables are predictors of nursing student success in community college systems.

## **The Nursing Shortage**

Several studies have identified urgency in finding solutions to the nursing shortage as it continues to grow in severity. According to Biviano et al.(2004), “By 2020 the national shortage is projected to increase to more than 1 million FTE RN’s if current trends continue, suggesting that only 64% of projected demand will be met” (Biviano et al., 2004, p. 26). The U.S. Department of Labor (2007) reported that registered nurses constitute 2.4 million jobs with employment needs expected to increase rapidly through 2014. As experienced nurses and nursing faculty retire, thousands of job openings will result, “especially as the median age of the registered nurse population continues to rise” (U.S. Department of Labor, 2007, p. 1). According to a recent analysis on the nursing shortage:

Inadequate nurse staffing has been a factor in 24 percent of the 1,609 cases involving patient death, injury or permanent loss of function reported since 1997. In hospitals across the country, 126,000 nursing positions remain unfilled, while 90 percent of long-term care facilities don't have enough nurses to provide even the most basic care. . . . By 2020, there will be at least 400,000 fewer nurses available to provide care than will be needed. (Sigma Theta Tau International Honor Society of Nursing, 2007, p. 1)

Nursing shortages have historically been cyclic in nature. Previous methods to tackle shortages have been market driven providing short-term fixes that did address the issue of nursing education. Rather than examining underlying issues driving shortages, the primary focus was on monetary compensation and importing of nurses from other countries. When shortages subsided, the status quo was resumed and nursing and nursing education were no longer a priority issue.

The imbalance in diversity between the nursing workforce and the United States population is creating challenges in providing care for minority groups. Women have many more employment options than in the past and this has impacted nursing, historically known as a female-oriented occupation. Recruiting men and minorities into nursing continues to be a priority issue. Higher acuity rates, fewer resources, and increasing demands have caused dissatisfaction in the workplace (Kimball & O’Neill, 2002).

Consumers of healthcare are increasingly aware of all aspects of healthcare due to the availability of data from online resources. As consumers have become more involved in their healthcare, added pressures for quality care and accountability are expected leading to competition in the healthcare arena. To meet the demands of the changing climate of healthcare in the United States, qualified nurses are needed to meet healthcare needs and provide high quality care.

In a study commissioned by the Robert Wood Johnson Foundation, Kimball and O’Neill (2002) explored nursing history; cultural, social, and economic factors associated with the current shortage; and approaches to addressing the nursing shortage to gain a better understanding complexity of issues involved. Kimball and O’Neill’s study found “strong evidence that the current shortage sharply differs from those of the past, although previous failures to address underlying issues weigh heavily in the current crisis” (Kimball & O’Neill, 2002, p. iii). The shortage of nurses affects patient safety and the quality of patient care. The number of nursing program graduates successfully passing the NCLEX-RN has a significant impact on addressing the current and future supply of nurses to meet community needs. According to the Center for Health Workforce Studies (2005), “Between 2000 and 2020, the U.S. population will add 19 million older adults. Overall the number of older adults in this

country will grow 138% in the next fifty years. By the year 2050, one of every five Americans will be age 65 or older” (Center for Health Workforce Studies, 2005, p. 10).

The U.S. Census Bureau (2001) reported a 13.2% increase in the U.S. population between 1990 and 2000 representing the largest census-to-census growth in population in American history. According to this report, 281.4 million people were counted in the United States in Census 2000. Population changes included size and distribution changes in regions, states, metropolitan areas, counties, and large cities. The data provided evidence of the increasing population growth in the United States and, as the healthcare needs of the baby-boomer population are increasing, the supply of nurses is diminishing. With increasing life expectancies and lower birth rates than in previous decades, an aging population will significantly impact the nation’s healthcare system and the profession of nursing.

Several issues make the need for nurses, frontline caregivers a high priority issue. First, an aging population will require a disproportionate share of healthcare resources (Center for Health Workforce Studies, 2005; Kimball & O’Neill, 2002). Second, few young people are entering the healthcare workforce. As the current nursing workforce continues to age, an increase in the number of nurses retiring is expected within the next decade (Kimball & O’Neill, 2002). According to Biviano et al. (2004) it is essential that an adequate supply of nurses and healthcare professionals be available to ensure access, affordability, and quality healthcare services in the U.S. Findings from their research indicate an on-going RN shortage will continue to worsen in the next two decades based on the growth and aging of the population and continued need for high quality healthcare services. The aging nurse population and impending retirements further support the need to attract individuals to the profession to support existing and future healthcare workforce demands (Biviano et al., 2004, p. 1).

## **Indiana's Healthcare Workforce**

Indiana's healthcare workforce shortage is approaching critical levels. According to the Indiana Department of Workforce Development (2007), long-term projections indicate a need for approximately 15,400 new registered nurses by 2014 or a projected growth rate of 29.6%. This is slightly higher than nationwide projections of a growth rate of 29.35%. Expanded career opportunities for women, new and changing technologies, new medical treatments, as well as an increasing demand for services from a decreasing supply of healthcare providers are major contributors to Indiana's nursing and healthcare professional crisis. The Indiana healthcare arena continues to change in the face of technological developments and an increasingly competitive world. Healthcare and nursing jobs are more skill-based. With the persistent decline in manufacturing employment, interest in pursuing education beyond high school is growing as individuals seek to expand their opportunities by changing professions.

As an open-access system, Ivy Tech Community College of Indiana holds a key role in workforce and economic development across Indiana. The provision of qualified professionals to meet current and future workforce needs, especially in the healthcare sector, will contribute to the health and success of Indiana in the changing economic climate. Adding nurses to the local workforce will relieve the stress on existing nurses working long hours and provide qualified professionals to supplement early retirements and nurses seeking employment outside of the healthcare field.

## **Remedial Education Requirements**

Students entering nursing education programs are often confronted with a complex admissions process. They must complete the college admissions process, fulfill required remedial and general education course requirements, achieve a minimum grade point average,

and, finally apply for admission into the nursing program. This process places underprepared students at a greater disadvantage. While community colleges are open admissions systems, selective admission into nursing education programs presents a unique barrier to many students in conjunction with required remedial education which plays an essential role in the pre-program admission process.

Data from Ivy Tech Community College (2007a) indicate “Students taking one or more remedial courses in the specified term, on average, accounted for 25% of the total student population and 13.3% of FTE” (Ivy Tech Community College, 2007a, p. 4). Many students seeking admission into community college ADN programs must successfully complete or test-out of all required remedial courses in English or mathematics courses prior to admission.

Therefore, it is important that the impact of remedial education as a predictor of student success be examined and understood. Remedial courses provide a review and primary instruction in basic mathematics and English enhancing skills often not mastered in the public schools or, if they are non-traditional students, may have forgotten. The question becomes whether remedial courses are predictors of student success as measured by final cumulative GPA and passing or failing the NCLEX-RN.

### **Nursing Student Outcomes and the NCLEX-RN**

Colleges and universities are under more scrutiny today than ever before to provide evidence of accountability. This accountability typically involves the use of evaluation measures accurately reflecting institutional performance in providing students with the knowledge, skills, and competencies required for workforce success (Dwyer, Millett, & Payne, 2006; Millett, Payne, Dwyer, Stickler, & Alexiou, 2008; Millett, Stickler, Payne, Dwyer, & Alexiou, 2007). For nursing program administrators, the benchmark for accountability is first-time annual pass

rates on the NCLEX-RN examination (Davenport, 2007; Lauchner, Newman, & Britt, 2006; Newman, Britt, & Lauchner, 2006). As the rigor of the NCLEX-RN has increased over the years, some programs have experienced a corresponding decrease in their graduates' first-time pass rates. Failure of the licensure exam results in delayed employment directly affecting the number of licensed nurses available to meet current and future healthcare needs. Low first-time pass rates on the NCLEX-RN examination may also influence the continued accreditation status of the individual nursing program.

One of the most widely used indicators of nursing program quality is graduate success on the NCLEX-RN licensure examination. Successful completion of nursing education programs and passing scores on the NCLEX-RN examination have been major concerns for nursing graduates, faculty, administrators, employers, and society. For employability, nursing graduates must obtain licensure prior to being hired as a nurse. Failure of the NCLEX-RN not only limits the supply of nurses, but also causes emotional and financial hardships for the graduate (Poorman & Webb, 2000).

As the nursing shortage continues to progress, educators are increasingly examining predictors of success and barriers to achievement to identify students at risk and intervene in a timely and effective manner. Although several independent and national studies have been conducted on academic and non-academic predictors of achievement, few studies were identified describing the impact of remedial education on nursing student success. Predictors of nursing student success in all levels of nursing have been examined in prior studies and include both academic and non-academic factors (Barkley, Rhodes, & Dufour, 1998; Daley, Kirkpatrick, Frazier, Chung, & Moser, 2003; Gallagher, Bomba, & Crane, 2001; Grzegorzcyk, 1995; Haas, Nugent, & Rule, 2004; Higgins, 2005; Lamm & McDaniel, 2000). According to Barkley et al.

(1998), grades in nursing theory and clinical courses, and National League for Nursing (NLN) achievement test scores were indicators predictive of NCLEX-RN success. A study by Daley et al. (2003) examined two cohorts of graduating seniors ( $N = 224$ ) and identified two variables associated with nursing student success: the final medical-surgical course grade and cumulative GPA.

Other researchers have conducted studies focusing on minority and disadvantaged students (Burris, 1990; Condon, 1996; Fearing, 1996). Burris analyzed student support services, faculty development, and peer tutoring utilized in an effort to facilitate academically disadvantaged nursing students towards successful program completion. Services provided were designed to correlate with nursing courses and were available to all students. Student evaluations indicated positive responses to the interventions and reflected the project's success. Burris concluded that annual attrition rates decreased and students continued to achieve high pass rates on the NCLEX-RN examination.

National studies have provided a broad range of data obtained from a variety of stakeholders interested in the nursing shortage and nursing education issues (Center for Health Workforce Studies, 2005; Health Resource & Services Administration, 2002, 2004, 2005, 2006; Kimball & O'Neill, 2002; U.S. Census Bureau, 2001). However, an analysis of individual studies indicates that prediction of success remains inexact and is based on a wide variety of academic and non-academic variables. Conflicting findings exist regarding gender, motivation, age, marital status, ethnicity, student goals, grade point averages, and the need for remedial education. Sample size in some studies was limited, especially in areas of ethnic group and gender (Haas et al., 2004).

**Statement of the Problem**

The role of community colleges in preparing students for employment in the healthcare field, especially nursing, is increasingly important. Understanding which variables contribute to student success in nursing programs will ultimately lead to improved healthcare for the entire population. Many students entering community colleges do not have the skills necessary to be successful in their studies and it is important to assess how the number and type of remedial courses impact student success (DiMaria, 2006; Germanna Community College, 2002; Gilroy, 2006b; Hoyt, 1999).

Community colleges have long provided affordable access to underserved populations across the country. According to the National Center for Education Statistics (2006) for the year 2003-2004, approximately 7.6 million students were enrolled in community colleges which provide opportunities for many academically disadvantaged students to achieve success in college level work and obtain needed job skills. For many adult students, remedial education is the key to opening the doors of nursing education and achieving the goal of a successful career in nursing. Graduate nurse failure of the NCLEX-RN examination affects the pool of qualified nurses to meet the healthcare needs of an aging population. If ADN programs are to improve and adequately meet the challenge of providing sufficient numbers of highly qualified nurses to meet society's healthcare needs, examination of the impact of college environmental variables such as remedial education is important for nursing student success.

**Purpose of the Study**

The purpose of this quantitative, retrospective, prediction study was to gain an understanding of factors influencing nursing student outcomes. The study examined the impact of remedial education on ADN student success as measured by final cumulative GPA and

subsequent pass or fail rates on the NCLEX-RN examination. Personal characteristic variables of age, gender, and ethnic group were examined to determine whether they were predictors of success for graduates of Ivy Tech Community College of Indiana ADN graduates for the period 2004 through 2007.

The purpose of this study was threefold: (a) to identify select student demographic variables upon admission to the college system and their impact on nursing graduate outcomes; (b) to analyze the predictive relationship between the number and type of remedial courses on nursing graduate outcomes while holding other variables constant; and (c) to examine the relationship between select student demographic variables on nursing graduate outcomes. Utilizing Astin's (1993) Input-Environment-Outcomes (I-E-O) model the study focuses on inputs (student characteristics at time of entry into the college system), environment (number and types of remedial courses taken), and performance outcomes (final cumulative grade point average and first-attempt passing score on the NCLEX-RN examination) of ADN graduates between 2004 and 2007 in a state-wide community college system.

### **Research Questions**

The following research questions were developed in relation to specific remedial education needs and demographic variables of associate degree nursing students enrolled at Ivy Tech Community College of Indiana who graduated between 2004 and 2007. The research questions for the study are as follows:

**Research question 1a.** What is the relationship between age, gender, and ethnic group and the number of remedial courses taken by associate degree nursing graduates from 2004 to 2007?

**Research question 1b.** What is the relationship between age, gender, and ethnic group and the type of remedial courses taken by associate degree nursing graduates from 2004 to 2007?

**Research question 2a.** To what extent do the number of remedial courses and type of remedial courses predict final cumulative grade point average (GPA) for associate degree nursing graduates from 2004 to 2007 when holding age, gender, and ethnic group constant?

**Research question 2b.** To what extent do the number of remedial courses and type of remedial courses predict pass/fail rates on the NCLEX-RN for associate degree nursing graduates from 2004 to 2007 when holding age, gender, and ethnic group constant?

**Research question 3a.** What is the relationship between age, gender, and ethnic group on final cumulative grade point average (GPA) for associate degree nursing graduates from 2004 to 2007?

**Research question 3b.** What is the relationship between age, gender, and ethnic group on pass/fail rates on the NCLEX-RN for associate degree nursing graduates from 2004 to 2007?

### **Significance of the Study**

Several studies have examined variables predictive of success in all levels of nursing education (Barkley et al. 1998; Daley et al., 2003; Gallagher et al., 2001; Grzegorzczuk, 1995; Haas et al., 2004; Higgins, 2005; Lamm & McDaniel, 2000), but few have analyzed the impact of remedial education courses on nursing student success in community college systems. Enrollment increases, student demographic changes, increasing diversity of the population in general, and limited space in nursing education programs make studies on variables that affect successful outcomes critical. With an increase in the number of remedial education programs at community colleges, evaluation of student achievement in relation to remedial courses is essential.

Completion of remedial coursework is a requirement for admission into many nursing programs including programs at Ivy Tech Community College of Indiana. Effective remediation in nursing education programs is essential to avoid increasing the already high attrition rates in community college systems. Unsuccessful remediation provides fewer educational choices for students other than non-degree programs or transfer to another college system. By examining the impact of required pre-admission remedial education on nursing student success, information for college faculty and administrators can be gathered to better prepare associate degree nursing students for successful outcomes to meet the growing nursing shortage needs in this country.

### **Definition of Terms**

In any study, it is important to define terms used so there is a common understanding. The following terms and definitions were used throughout the study.

*Age*: refers to the age of the student at the time of admission to the college and is self-reported on the college application form.

*Campus*: refers to the site within the 14 regions of Ivy Tech Community College's statewide system where ADN programs are offered.

*Ethnic Group*: categorized as European-American, African-American, Hispanic-American, Native American, Asian or Pacific Islander-American, other, or not reported.

*Final Cumulative Grade Point Average*: refers to the final cumulative grade point average of the student at completion of the nursing program.

*Gender*: categorized as female or male.

*I-E-O Model*: Astin's (1993) I-E-O model places emphasis on three elements: inputs; environment; and, outcomes. Inputs "refer to those personal qualities the student brings initially to the education program" (Astin, 1993, p. 18). Input data could include gender, age, ethnic

background, ability, and socioeconomic level. Inclusion of input data is necessary as it can directly affect both the environment and outputs. Most educational research occurs in natural settings; consequently, the “I-E-O model was designed to address the basic methodological problem with all non-experimental studies in social sciences, namely random assignment of people (inputs) to programs (environments)” (Astin & Sax, 1998, p. 252).

*Input Variables:* consists of three student demographic variables: age; gender; and ethnic group.

*NCLEX-RN:* the National Council of State Boards of Nursing (NCSBN) Licensure Examination for Registered Nurses is a comprehensive examination measuring entry-level expected competencies for newly licensed registered nurses. Any graduate of an approved nursing program is eligible to take the examination. A passing score on the examination is required to practice nursing in the United States. Scores are reported to schools of nursing as either pass or fail. Success on the NCLEX-RN is defined as a first-attempt passing score (National Council of State Boards of Nursing, 2008a).

*Remedial Education:* comprises basic skill courses which may be required prior to admission to the community college and must be completed or waived out of prior to admission to a nursing education program. Students are assigned to remedial courses in English or mathematics based on pre-entry assessments.

## **Summary**

Background evidence strongly supports the need for investigation into variables impacting nursing student outcomes. As the nursing shortage continues to grow in Indiana and across the United States, it is imperative that educational institutions examine methods for improving student results on the NCLEX-RN, thus, providing nurses to fill a growing number of

healthcare provider openings. Application of Astin's (1993) I-E-O Model provided a framework for viewing the effect of remedial education on ADN student outcomes as evidenced by final cumulative GPA and first-time pass rates on the NCLEX-RN licensure examination.

As stated previously, remedial education is often the key to opening the doors of opportunity for those interested in nursing education and in fulfilling their goal of a successful career in the healthcare arena. Because many individuals require at least one remedial education course during their community college career, examination of the impact of remediation on nursing student success will provide information to assist educators and college administrators in development and implementation of improved methods for enhancing student program completion and success on their licensure examinations.

## CHAPTER 2

### **Literature Review**

A literature review was conducted to explore existing research regarding the impact of remedial education on associate degree nursing student outcomes. This chapter first examines studies regarding nursing shortage issues and trends, changes impacting nursing, workforce demands, the NCLEX-RN examination and its relationship to nursing practice and program outcomes, nursing education, and diversity. A profile of underprepared students is provided with discussion on academic support and student retention.

The remedial education section covers the prevalence of remedial education needs in today's college systems, the debate surrounding costs of remediation, studies on remedial English and mathematics courses, student outcomes, and remediation at Ivy Tech Community College. A review of studies on associate degree nursing programs and NCLEX-RN preparation is provided. The chapter concludes with discussion of Alexander Astin's (1993) theoretical model of inputs, environment, and outcomes as the research model utilized for this study.

The terms *developmental* and *remedial education* and *courses* are often used interchangeably throughout the literature. Different institutions may use the designations *remedial*, *developmental*, or in some cases, *compensatory* (Perkhounkova, Noble, & Sawyer, 2005). However, Boylan and Bonham (2007) define *developmental education* as "a broad range of courses and services organized and delivered in an effort to help retain students and ensure the

successful completion of their postsecondary education goals” (Boylan & Bonham, 2007, p. 2). Remedial courses for academically underprepared students represent one end of the spectrum of developmental programs. For the purpose of this study, the term *remedial* was used to denote the typical non-credit courses to which entering students are assigned on the basis of low scores on placement tests such as the Computerized Adaptive Placement Assessment and Support Systems (COMPASS) and the Assessment of Skills for Successful Entry and Transfer (ASSET).

As the demand for qualified nurses continues to soar across the country, nursing programs are actively expanding their course offerings in conjunction with local healthcare facilities (Medlyn, 2000) and examining methods to improve student outcomes. Over the last several years, the focus in higher education has evolved from one of inputs to outcomes, increasing the pressure on college administrators and faculty to provide successful accountability measures to meet both public and accreditation body expectations. Successful first-time pass rates on the NCLEX-RN are one of the most important measures of nursing student success.

Graduate nurse failure of the NCLEX-RN examination affects the pool of qualified nurses to meet the healthcare needs of an aging population and can negatively impact on-going program accreditation. With increasing numbers of nursing students in community college programs, remedial education course needs and the impact on nursing student success is vital. Research in both areas has been broad and provided a wide range of findings.

With open enrollment policies, community colleges serve a much broader spectrum of students than baccalaureate institutes. This includes a high proportion of students who begin their studies with inadequate preparation for college level academic coursework (Bailey & Alfonso, 2005; Bailey, Calcagno, Jenkins, Kienzel, & Leinbach, 2005; Bettinger & Long, 2005; Community College Survey of Student Engagement, 2007; Grimes, 1997; Grimes & David,

1999). As a result, the most prevalent retention strategies employed by community colleges can be grouped into the three categories of student advising, academic support, and assessment (Habley & McClanahan, 2004). Two-year institutions boasting the highest rates of retention place a powerful emphasis on academic support.

Virtually all (98%) of two-year public institutions provide remedial courses in the areas of reading, writing, and mathematics and are more likely to offer a range of remedial courses than four-year institutions (Parsad & Lewis, 2003). Trends over the past decade show that both two-year and four-year institutions are adopting more stringent policies such as limiting the duration of time students can spend in remedial courses at their institution, placing restrictions on students' simultaneous enrollment in remedial and credit courses, and making participation in remedial courses mandatory for students whose placement scores classify them as academically underprepared.

More than 40% of first-year community college students participate in at least one remedial course (Parsad & Lewis, 2003). However, despite the increasing number of students enrolled in remedial courses, Bettinger and Long (2005) observe that there is actually minimal understanding of the impact of remediation on student outcomes. The topic of developmental education has become a major source of debate (Boylan & Bonham, 2007; Perkhounkova et al., 2005). Critics stress the expense of providing students with remedial education. Advocates contend there is substantial return on investment to the institution and the greater society.

A search using the key terms *nursing students* and *remediation* yields very few studies on the topic of remedial or developmental education. Perin's (2006) exploration of community college students aspiring toward an associate degree in nursing (ADN) is a notable exception. The studies of Phillips, Spurling, and Armstrong (2002) and Seago and Spetz (2003) on

admission requirements, performance, and persistence in California community college nursing programs were commissioned in response to the state's critical shortage of registered nurses (RNs). Along with Sandiford and Jackson (2003), Phillips et al. used conceptual models to examine persistence in ADN students.

Predictions indicate that the United States faces an impending nursing shortage unparalleled in previous eras (Biviano et al., 2004; Goodin, 2003). This is routinely acknowledged in the nursing literature where the same search terms produce numerous articles on remediation for students at risk for failing the National Council Licensing Examination for Registered Nurses (NCLEX-RN). There have been systematic efforts among nurse educators to identify factors predicting students' success on the NCLEX-RN (Barkley et al., 1998; Davenport, 2007; Sayles, Shelton, & Powell, 2003; Schwarz, 2005; Stuenkel, 2006; Uyehara, Magnussen, Itano, & Zhang, 2007; Waterhouse & Beeman, 2003). The introduction of the Evolve REACH Exit Examination (E<sup>2</sup>) by Health Education Systems (HESI) has enabled educators to target students in need of remediation with remarkable accuracy (Lauchner et al., 2006; Newman et al., 2006; Nibert & Young, 2006; Nibert, Young, & Adamson, 2002; Nibert, Young, & Britt, 2006). Progression policies and remediation programs based on HESI data have effectively raised the number of students passing the NCLEX-RN (Sifford & McDaniel, 2007). However, these interventions are implemented for students who have successfully completed most of their coursework and are nearing graduation.

Davenport (2007) declares that nursing programs must begin preparing students for the licensure examination from the time they enroll as freshmen. The overwhelming majority of nursing students who drop out of the program do so within the first year (Potolsky, Cohen, & Saylor, 2003). This parallels the overall trend in higher education (Levitz, Noel, & Richter,

1999; Tinto, 1993). In fact, the first year of college is pivotal in predicting retention. The strategies used in remedial programs for students at risk for failing the NCLEX-RN include test-taking strategies, time-management skills, learning styles profiles, study groups, and techniques for managing test anxiety (Davenport, 2007; Sayles et al., 2003; Sifford & McDaniel, 2007). These are components of a comprehensive community college developmental program (Boylan & Bonham, 2007).

One obstacle to understanding the pathways between remedial education and student outcomes is the plethora of factors involved (Hoyt, 1999). It has also been argued that conceptual models of student persistence were formulated to capture the experience of traditional students pursuing a four-year degree (Bailey & Alfonso, 2005). These issues further underscore the need to examine the relationship between remedial education and student success.

Astin's (1993) Input-Environment-Outcome model of college student development offers a mechanism for examining the intricate relationship between participation in remedial education and obtaining an associate degree. Several sources reviewed for this project used Astin's model to investigate the impact of remedial courses on the persistence of academically underprepared community college students (Campbell & Blakey, 1996; Long & Amey, 1993; Zhao, 1999). Astin (1997) consistently emphasizes the importance of student input characteristics in providing an accurate assessment of institutional performance. He argues that focusing only on outcomes such as retention, transfer rates, or standardized test performance provides a one-sided, if not misleading, portrayal. Levitz et al. (1999) point out that some institutions dedicated to serving all students are known for innovative student-centered programs that effectively raise their retention rates. These institutions successfully *engage* their students, which translates into more

positive student outcomes (Community College Survey of Student Engagement, 2007; Kuh, 2007).

### **Nursing Shortage Issues and Trends**

The nursing shortage has been well documented in recent literature. The focus for this section will include an examination of changes impacting the need for qualified nurses in America, the issue of supply and demand, and workforce demands. Several independent and national studies indicate that the need for nurses to meet the needs of an aging population will outweigh the current and future supply. It is important for nursing faculty and administrators to examine these issues to assist in identifying methods for providing qualified healthcare professionals in the future.

### **Historical Changes Impacting Nursing**

The 20th century witnessed several improvements in standards of living, sanitation, longer life spans, medicine, medical treatments and economic growth; and today, nursing education faces new challenges. As noted by Heller, Oros, and Durney-Crowley (n.d.), population shifts, advances in healthcare, increasing diversity, economic changes, and access to healthcare have impacted nursing education. Schools of nursing must provide a variety of educational methods, practice settings, and research that reflects and values the diversity of students and the population. As the healthcare landscape continues to change, nursing education and successful graduate outcomes play a significant role in ensuring the health and well being of our communities.

### **Current Trends**

The nursing shortage has been making national headlines for the last several years. The current U.S. shortage of nurses is one of the most severe ever experienced and already impacting

the nation's healthcare system. A healthcare crisis looms in the future of this country and is based on merging issues: an aging baby-boomer generation; expanding career opportunities for women leading to decreased enrollment in nursing programs; an aging labor force including nurse educators; issues of inequality and respect surrounding the nursing profession; limited numbers of individuals pursuing nursing careers; and people living longer, in many respects due to expansions and advances in technology in healthcare (Reinhard, Barber, Mezey, Mitty, & Peed, 2002). According to the Alliance for Aging Research, (2002):

Today, February 27, 2002, nearly 6,000 Americans will celebrate a 65th birthday. Ten years from today, the U.S. will have nearly 10,000 people a day turning age 65. We have less than 10 years before the huge first wave of Baby Boomers ignites a Senior Boom. If the U.S. fails to reform professional health education . . . we can't be surprised with the consequences. It will be a crisis that was a long time in coming and with plenty of warning. There will be no easy excuses. (Alliance for Aging Research, 2002, p. 1)

The Center for Health Workforce Studies (2005) indicates, "By the year 2020, the supply of RNs is projected to fall 29% below predicted requirements" (Center for Health Workforce Studies, 2005, p. 14).

According to Goodin (2003), the nursing shortage has been attributed to many factors including professional burnout, unappealing work climates, lack of job satisfaction, quality of care issues, and lack of managerial support. An aging RN workforce and fewer individuals seeking admission into nursing education programs have compounded the problem. Decreasing slots available in nursing programs are prevalent due to aging and retiring faculty with few individuals available to replace them and inadequate resources such as funding, clinical space, equipment, and supplies to educate nursing students. Younger nurses entering the profession are

often not as attracted to areas such as geriatric health or work in long-term care settings where the median age for registered nurses is 44 years old (Health Resources and Services Administration, 2004). An altered professional landscape largely resulting from managed care is another force underlying the nursing shortage problem.

As the RN workforce ages the prospect of impending retirements for faculty and staff nurses looms in the near future. This trend reflects the tremendous influx of women into the nursing field in the 1960s and 1970s followed by a gradual decline as more opportunities for women evolved (Goodin, 2003). Concurrently, the population in the United States is aging as well. Managed healthcare, an increase in the elderly in the population, and higher levels of patient acuity and chronic health problems have led to a change in the work environment for nurses and the need for more complex healthcare services.

Another contributor to the nursing shortage is the negative image and portrayal of nurses and nursing emanating primarily from media stereotypes such as those portraying nurses as “the physician’s handmaiden” (Goodin, 2003, p. 335). While surveys show nurses inspire a tremendous amount of trust, their work is frequently underappreciated and there is a lack of clarity in the public perception of the nurses’ professional role. However, current media campaigns emphasize the impact of nursing on patient outcomes. Combined effects of a dwindling nursing workforce, a mushrooming elderly population, and fewer individuals entering nursing as a career underlies the drastic forecast for a severe nursing shortage (Biviano et al., 2004). Projections from the Nursing Supply Model (NSM) and the Nursing Demand Model (NDM) indicate that, if present trends continue, the shortage of RNs will increase significantly over the next 20 years.

Although downward enrollments have been reported for some time, there are signs that the trend is reversing. The same is true for graduations, which follow a parallel pattern. Graduations from nursing programs declined sharply in the mid-1990s and have since showed signs of rebounding (Jacobson & Kaufman, 2004). However, the current increase is not sufficient to offset the previous decline or to meet projected future demands for RNs (Biviano et al., 2004). Baccalaureate (BSN) programs reported the smallest increase in graduations since 2002 (2.2%). In contrast, ADN programs experienced a 7% rise in graduations (Jacobson & Kaufman, 2004). Although diploma programs reported a sizable gain (11.5%), the number of diploma programs has steadily decreased. ADN programs supply the bulk of RNs in the U.S., thus, underscoring the importance of facilitating the academic progress of aspiring ADN candidates. This reality drove the research projects on California community college nursing programs (Phillips et al., 2002; Seago & Spetz, 2003).

In response to the projections, educators are calling on nursing programs to expand their recruitment initiatives and intensify efforts to ensure that their students successfully graduate and pass the NCLEX-RN examination (Lauchner et al., 2006; Newman et al., 2006; Nibert & Young, 2006; Nibert et al., 2002; Nibert et al., 2006). New strategies are underway as collaboration between educators, healthcare facilities, and middle and high schools increases. “Career days” and “shadow days” for high school students interested in nursing and healthcare have demonstrated effectiveness in increasing interest in nursing as an attractive career option (Goodin, 2003). K. A. Williams (personal communication, May 6, 2008) states that the North Central Region of Ivy Tech Community College works with the Indiana Area Health Education Centers (AHEC) and regional hospitals to sponsor nurse camps for high school health occupations students. These efforts provide opportunities to attract younger students into the

profession and change misconceptions about nursing and nursing practice. Increasing interest in nursing school admissions signifies that these public relations efforts are having a positive effect on attracting more individuals into nursing programs.

Nursing continues the battle with equality, growth, and respect as an important and significant profession in today's society. The question of what lies ahead for nursing education is speculative as nursing is continually changing based on societal needs. Society expects nursing services and care for the sick. As nursing education continues to grow, it must provide for the future society while maintaining high standards and quality educational programs. Diseases such as cholera, smallpox, and tuberculosis are rare to non-existent but a new spectrum of diseases such as the current outbreak of the H1N1 (swine) flu and other disorders are underfoot and have changed the focus of nursing care as it has in the past. Increasing salaries, better working conditions, instruction provided in the college or university setting, and higher standards in nursing education are results of the many struggles endured in early days.

### **Workforce Demands**

A study entitled, *Nursing Education in Five States: 2005* (Health Resources and Services Administration, 2005), was recently conducted using data from five states (California, Georgia, Indiana, Texas, and Utah). This study examined state support for nursing education and strategies being pursued in efforts to expand the nursing workforce. Some challenges identified for Indiana included: lack of institutional capacity, drop in the number of new licensed practical nurses (LPNs) and RNs between 1994 and 2001, shrinking pool of young workers, and lack of interest in nursing among high school graduates. While enrollment trends appear to be improving in Indiana, the demand for nurses continues to increase while the number of RNs per capita remains below the national average.

The Indiana Department of Workforce Development (2008) has created a recent list of the states “Hot Jobs” (Indiana Department of Workforce Development, 2008, p. 1). Criteria for selection include rank in the top 200 for total growth and percent growth from 2004 through 2014 with the percent growth being over the statewide average of 9.9%. Based on this criteria, registered nursing ranked number one on the list with an expected growth of 15,400 nurses (29.7%) from 2004 through 2014. The American Association of Community Colleges (McPhee, 2004) conducted a 2004 Hot Program and Homeland Security Survey to identify programs with “a large market demand for graduating students” (McPhee, 2004, p. 1). The most frequently cited hot programs were allied health, accounting for 46.6% of all hot programs. Within this category, registered nursing was the most popular representing 19.6% of all hot programs and 16% of all students enrolled in hot programs.

The trend in hot programs parallels workforce demands (McPhee, 2004). In 2000, information technology (IT) programs were the most prevalent hot programs. The bursting of the *dot.com bubble* marked an unforeseen change that dramatically altered the economic landscape of the U.S. While the phenomenon highlights the difficulty of forecasting the course of economic and employment trends, the escalating need for RNs has been systematically documented (Biviano et al., 2004; Goodin, 2003).

The national trend in hot programs reflects events taking place at the local level. Many community colleges have been actively expanding their nursing programs and introducing new programs in response to the healthcare needs of the communities they serve (Medlyn, 2000). Miami-Dade Community Colleges and Broward County Community College in Florida are respectively the first and second largest ADN programs in the country. The state’s large elderly population creates a constant demand for qualified nurses. Upon introducing a LPN program,

Miami-Dade was immediately approached by local healthcare centers to add slots for LPNs who aspire to be RNs.

Even programs that experienced declines in the 1990s are expanding their nursing programs in response to increasing numbers of applicants (Medlyn, 2000). New fast-track ADN programs have emerged in Indiana and across the country allowing students to complete a typical 24-month program in as few as 12 to 16 months. New technology such as advanced patient simulators are enhancing student experiences in nursing programs. As competition intensifies, community colleges are compelled to demonstrate successful student outcomes (Astin, 1997; Habley & McClanahan, 2004). For nursing programs, successful first-time passage of the NCLEX-RN is the accepted technical outcome measure of student success across the United States because licensure is required for entry into practice. Thus, it is important that predictors of nursing graduate success be identified and understood.

### **The NCLEX-RN**

The purpose of the NCLEX-RN, developed and revised regularly by the NCSBN, is to regulate nursing practice and provide a method for ensuring competent patient care. According to the National Council of State Boards of Nursing (National Council of State Boards of Nursing, 2008a), “To ensure public protection, each jurisdiction requires a candidate for licensure to pass an examination that measures the competencies needed to perform safely and effectively as a newly licensed, entry-level registered nurse (National Council of State Boards of Nursing, 2008a, p. 1). The impact of NCLEX failure reverberates at the individual, institutional, and societal level (Lauchner et al., 2006; Schwarz, 2005).

The NCLEX-RN is organized into four major client needs categories: safe and effective care environment; health promotion and maintenance; psychosocial integrity; and, physiological

integrity. In response to the changing roles of nurses, the NCSBN raised the passing standard for the NCLEX-RN in 1988 and again in 2004 (Schwarz, 2005) and 2007 (National Council of State Boards of Nursing, 2008b). These changes were based on current practice analyses identifying increasing demands in the competencies, roles, and responsibilities of new nurses (Schwarz, 2005; Sifford & McDaniel, 2007). Between 1994 and 2000, the annual NCLEX-RN pass rate dropped from 90.3% to 83.8%.

However, the pass rate for first-time, U.S. graduates in 2007 was 85.5%, showing some increase from 2000 (National Council of State Boards of Nursing, 2008b). The pass rates for diploma, baccalaureate, and associate degree programs are very similar (87.9%, 86.4%, and 84.8%, respectively). While the lower pass rates of ADN programs compared to baccalaureate nursing programs may not reach statistical significance, the differences still warrant attention from community college program administrators.

As the passing standard for the NCLEX-RN has risen, some programs have experienced a corresponding decrease in their graduates' first-time pass rates. Each year a proportion of RN candidates successfully graduate from their nursing programs but fail the licensure examination. Frith, Sewell, and Clark (2006) note that NCLEX-RN failure results in “delayed employment as a registered nurse, loss of income, and harm to self-esteem. . . failure of NCLEX-RN by a substantial number of students can jeopardize a program's reputation” (Frith, Sewell, & Clark, 2006, p. 1).

The consequences of not passing the NCLEX-RN are substantial for the individual and society. The workforce suffers through inadequate numbers of nurses to meet current and future healthcare needs and the individual bears both financial and psychological burdens. Poorman and Webb (2000) examined the impact of failing the NCLEX-RN using a sample of 10 nursing

graduates. This qualitative study consisted of interviews designed to gain an understanding of the experience of failing the licensure examination. The research identified several themes including feelings of failure, loss of identity of being a nurse, doubting past accomplishments, and seeing self as damaged goods. Graduates failing the NCLEX-RN indicated feeling abandoned and cut off from the nursing faculty and student community. While efforts among nurse educators to identify factors predicting students' success on the NCLEX-RN have occurred (Barkley et al., 1998; Davenport, 2007; Sayles et al., 2003; Schwarz, 2005; Stuenkel, 2006; Uyehara et al., 2007; Waterhouse & Beeman, 2003), many proposed interventions are not implemented until the end of the program of study and in preparation for the licensure examination.

Nursing programs are widely recognized by community colleges as one of the high-market, high-demand programs for new graduates (McPhee, 2004). As open enrollment institutions, community colleges play an essential role in enabling individuals to develop to their fullest potential and enhance the economic development of this country. Successful completion of the NCLEX-RN examination for nursing students hinges upon providing students with sufficient education and support to progress academically. With increasing numbers of nursing students in community college programs, remedial education course needs and the impact on nursing student success is vital.

### **Nursing Education**

Changes in the educational production of nurses have occurred over the last several years. Between 1996 and 2000, the growth of the RN population was the slowest between the 20-year period of 1980 and 2000 (Center for Health Workforce Studies, 2005). High numbers of nurses retiring, changing professions, and the decrease in graduation numbers have impacted this trend.

In July 2002, the Nurse Reinvestment Act became law and provided scholarships and grants for nurses and nursing education. While the full impact of this funding is not yet understood, it is hoped that this incentive will help to increase the supply of nurses in the country.

According to Jacobson and Kaufman (2004), nursing program graduate numbers declined sharply in the mid-1990s but are now beginning to rebound. ADN programs experienced a 7% rise in graduations since 2002 while baccalaureate (BSN) nursing programs reported a smaller increase of 2.2%. While the greatest increase in the number of graduates is from ADN programs in contrast to baccalaureate programs, it will not be sufficient to overcome the previous decline or meet future demands for RNs (Biviano et al., 2004). In the United States, ADN programs supply the bulk of RNs, further underscoring the importance of facilitating the academic progress and success of ADN students.

It is not uncommon for students entering community colleges to test into remedial courses, which must be completed before admission into nursing programs (DiMaria, 2006; Germanna Community College, 2002; Gilroy, 2006b; Hoyt, 1999). However, research in the area of remedial education and ADN programs is limited. While several studies focus on baccalaureate nursing students, some debate exists on whether or not results from these studies can be generalized to those in ADN programs. Although there are differences in academic preparation between associate and baccalaureate degree programs, the U.S. Department of Labor's (2007) Occupational Outlook Handbook does not identify distinctions in the nature of work for any degree level of registered nursing. Further, nursing graduates from any registered nurse program take the same licensure examination. Therefore, application of results from baccalaureate programs may indeed be appropriate at the associate degree level.

## **Increasing Diversity**

Higher education in the United States has a history of exclusion and segregation. The elimination of segregation led to an increase in enrollment for students of color in a variety of institutions. Students who attend colleges and universities arrive at the doors of the institutions as individuals with differing races, ethnicities, genders, sexual orientations, religions, and ages as well as embodying differing stages of development psychosocially and cognitively. The identities they arrive with will be challenged, developed, solidified, and stabilized as they progress through their college experience (Chickering & Reisser, 1993; Pascarella & Terenzini, 2005; Torres, Howard-Hamilton, & Cooper, 2003).

Access to higher education has been known to disproportionately affect low-income and minority students. Historically, these students have faced the greatest academic and financial challenges (U.S. Department of Education, 2006). Research identifies several obstacles to recruiting minority nurses including inadequate academic preparation in the sciences and English, lack of career counseling in high school, financial barriers, and the absence of scholarships. In addition, minority students enrolled in nursing programs report feeling socially isolated. These factors have negatively influenced the presence of minority students in nursing programs (Nibert et al., 2006). Technological advances, on-going changes in the global economy, and the need to develop highly skilled nurses to meet society's needs requires a greater understanding of the impact of the increasingly diverse college environment on student outcomes. As demographic changes continue to evolve on college campuses, institutions must be prepared to offer a variety of services and programs to meet the needs of culturally diverse students and develop innovative methods for attracting men and minorities into the nursing profession and facilitate their success on the NCLEX-RN.

Addressing diversity in healthcare education has been identified as a necessary component to meet the growing population diversity in the U.S. (Health Resources and Services Administration, 2005). Initiatives to create a more diverse nursing workforce have been in place since the late 1970s (Nibert et al., 2006). Although early efforts were largely unsuccessful, the composition of the RN workforce has become more ethnically diverse reflecting general population trends. As of 2000, minority nurses comprise 12% of all RNs compared to 7% in 1980s. The population distribution of minority nurses varies considerably across regions. Nurses who obtain their degrees at community colleges frequently intend to practice in that community (Medlyn, 2000). Therefore, the pattern is not unexpected. While the number of men in nursing has increased slightly, the proportion of men is still quite small, at 5.9% in 2001, up from 5.4% in 1996 (Goodin, 2003).

A variety of formal and informal support programs designed to enhance academic skills, address weaknesses in nursing knowledge, and promote social support networks for minority students have been implemented (Nibert et al., 2006). These support systems help students deal with various adversities at college, such as racism and cultural isolation and positively influence persistence (Guiffrida, 2005). Connections on campus within ethnic enclaves serve to facilitate development, growth, and persistence for minority students. Similar strategies are designed to enhance academic performance and retention for all students (Habley & McClanahan, 2004; Levitz et al., 1999; Tinto, 1993). As noted previously, for nursing students, many of these efforts are not introduced until the end of the nursing program or senior year to facilitate graduate success on the NCLEX examination (Nibert et al., 2006). Unfortunately, this approach to retention does not address the pivotal freshman year (Levitz et al., 1999; Tinto, 1993).

According to several studies (Bailey & Alfonso, 2005; Boylan, Bonham, & Tafari, 2005; Grimes, 1997; Grimes & David, 1999; Parsad & Lewis, 2003), minority, low-income, and first-generation college students are overrepresented in remedial education courses. A similar finding is noted for nursing students as well (Perin, 2006). Subsequently, efforts to expand the number of nursing program candidates and increase diversity in the workforce will mean an increase in the proportion of nursing students requiring remedial coursework.

Sifford and McDaniel (2007) argue that there is a widening gap between the standards for minimum levels of nursing competency and the academic credentials of students entering nursing programs. Therefore, students striving to pass the NCLEX-RN will require more intensive remediation. The statement is equally applicable to aspiring ADN students beginning their first semester at a community college.

There is empirical evidence that remedial programs for nursing students at risk for failing the NCLEX-RN are effective (Nibert & Young, 2006; Nibert et al., 2002; Nibert et al., 2006). Progression policies and remediation programs based on HESI data have proven to be effective (Sifford & McDaniel, 2007). The impact of remedial education on future student success is less conclusive (Perkhounkova et al., 2005).

Higher education is often a point of entry into a new culture and a time for development of individual autonomy. According to Ortiz and Rhoads (2000), application of a multicultural educational framework assists in “building culturally inclusive schools, colleges, and universities” (Ortiz & Rhoads, 2000, p. 1). As the population becomes increasingly diverse, a greater understanding of the cultural complexities and effects of the college environment for minority students will provide a basis for planning future education. Student diversity, workforce development needs, and a changing population will require the provision of high

quality, culturally sensitive educational programs in the future. Recruitment and orientation, proper testing and placement in developmentally appropriate courses, and the ability to match students to needed resources and support programs are essential ingredients for enhancing individual growth and development.

### **Profile of Underprepared Students**

The challenge of academically underprepared students is not new to higher education. As open-door institutions, there is a higher incidence of academically disadvantaged students, those requiring some form of remedial education entering community college systems. Community colleges play an important role in remediation with over 40% of first-year students at public two-year colleges taking remedial courses (U.S. Department of Education, 2006).

A study entitled, *CCSSE Engaging Students, Challenging the Odds*, was conducted in 2005 to examine objective data on student experiences for 133, 281 students in 257 colleges in 38 states (DiMaria, 2006). The purpose of this study was to gain a better understanding of student engagement in the college experience. Results indicated that 53% of the respondents “reported that they have taken or plan to take a remedial math, reading, or writing course” (DiMaria, 2006, p. 20). The study showed that underprepared students are typically more engaged than their academically prepared peers. Approximately 25% of the respondents in this study were students of color. When compared to white students, little differences were identified in student engagement.

The National Center for Education Statistics (NCES, 2001) provided data on *The Condition of Education* which found,

The proportion of freshmen enrolling in at least one remedial reading, writing, or mathematics course was higher at public 2-year colleges than it was for all other types of

institutions; 42% of freshmen at public 2-year colleges compared with 12% to 24% of freshmen at other types of institutions enrolled in such courses. (National Center for Education Statistics, 2001, p. 4)

Similar findings were noted in a recent study on the condition of education in the United States. According to the National Center for Education Statistics (2004):

. . . 28 percent of entering freshmen enrolled in remedial coursework (reading, writing, or mathematics) in fall 2000. Twenty-two percent undertook remediation in mathematics, 14% in writing, and 11% in reading. Freshmen at public 2-year colleges were the most likely group to enroll in a remedial course (42% vs. 12% to 24% of freshmen at other types of institutions). In addition to enrolling at higher rates, freshmen at public 2-year colleges spent more time, on average, in remediation than freshmen at 4-year institutions in fall 2000. Among institutions that offered remedial courses, 63% of public 2-year institutions reported that their students averaged a year or more of remedial course-taking, compared with 38% of public 4-year institutions and 17% of private 4-year institutions. (National Center for Education Statistics, 2004, p. 1)

Community college enrollment continues to increase (National Center for Education Statistics, 2004). However, the number of college students successfully completing a formal degree or technical certificate in the community college system is approximately 50% to 60% (Hoachlander, Sikora, & Horn, 2003). Johnson and Kreuzer (2001) observe that increases in at-risk students affect retention rates in higher education programs. Factors to consider along with low graduation and retention rates are an increase in enrollment numbers and a corresponding increase in the number of academically underprepared students.

Grimes and David (1999) consider community colleges a microcosm of American society that more accurately reflects the increasing diversity of the U.S. population than four-year colleges and universities. While the term *diversity* is ubiquitous in the literature, it fails to capture the degree of heterogeneity that exists between and within these groups. From this perspective, Grimes and David conducted an exploration of the characteristics of roughly 500 students entering a Florida community college in fall 1992. The study included only associate degree candidates, whose performance was tracked over three years via campus records.

The sample was essentially representative of the campus, comprised of 80% European-American students, 15.5% African-American students, and 4% Asian-American students (Grimes & David, 1999). Women represented 62% of the sample, and the average age of students was 23. The sample was evenly divided between students classified as college ready or academically underprepared. Those who achieved the designated cut off scores on the statewide Computerized Placement Test (CPT) in reading and English, combined with at least pre-algebra placement in mathematics, were categorized as college ready (51%). Students whose performance fell below those criteria were classified as academically underprepared.

Students in the two categories differed on a number of input variables (Grimes & David, 1999). Regarding sociodemographic features, only ethnicity influenced academic classifications. African-American students were disproportionately represented in the underprepared compared to the academically ready category (21% versus 6%). In terms of academic backgrounds, college-ready students took more courses in mathematics and biological and physical sciences and had an average high school GPA of B compared to B- for underprepared students.

Consistent with the differences in academic performance, college-ready students had significantly higher academic self-perceptions (Grimes & David, 1999). The self-appraisals of

college-ready students reflected higher perceptions of mathematical ability, reading comprehension and speed, writing ability, public-speaking ability, intellectual self-confidence, and emotional health. Distinctions also emerged in the areas of cooperation, achievement drive, and understanding of others. Although college-ready students had higher degree aspirations than those who were unprepared, both groups cited desiring a better job and higher income as major factors in their decision to attend college.

The lower academic self-efficacy of the underprepared students was evident in their expectations for future performance (Grimes & David, 1999). Underprepared students expressed higher probability of failing one or more courses, requiring additional time to earn a degree. By extension, they were less likely to feel they would graduate with honors or be appointed to an honor society. Despite entering college to obtain a better job, underprepared students were also less confident in securing employment. In a small sample of students from the same campus, Grimes (1997) found that college-prepared students were less prone to test anxiety and significantly more oriented toward internal locus of control. Lowering of control had the most powerful impact on achievement, suggesting that students who feel responsible for their own learning outcomes are more motivated to overcome obstacles to succeed.

Analysis of the students' academic performance disclosed significant differences between the two student groups (Grimes & David, 1999). The mean GPA was 2.82 for the college-ready students versus 2.36 for those who were underprepared. After three years, 15% of the college-ready students had graduated while 32% had earned more than 65 semester hours or were still enrolled. In contrast, only 2% of the underprepared students had earned a degree, with 25% finishing more than 65 hours or continuing their enrollment. At the end of the three-year study

period, the attrition rate of 73% for students who entered the institution underprepared far surpassed the attrition rate of 53% for their college ready counterparts.

Research indicates that a significant number of students entering college systems are underprepared for the rigors of college studies and require some form of remedial education (National Center for Education Statistics, 2001). Grimes and David (1999) declare that for community colleges to fulfill their mission of educating all students, they must provide a student centered learning environment that supports progressive growth and development. The authors are critical of an ad hoc approach to remediation instead advocating a holistic model of developmental education (Boylan & Bonham, 2007). Community colleges have a tremendous responsibility in addressing the needs of underprepared students and developing methods to promote student success.

### **Academic Support and Retention**

As open-enrollment institutions, community colleges serve a much broader spectrum of students than baccalaureate institutes. Students at community college often begin their studies with inadequate preparation for college-level coursework (Bailey & Alfonso, 2005; Bailey et al., 2005; Bettinger & Long, 2005; Community College Survey of Student Engagement, 2007; Grimes, 1997; Grimes & David, 1999). According to Davenport (2007), preparation for the nursing licensure examination should begin early in the nursing program. Research suggests that the majority of nursing students who drop out of the program do so within the first year (Potolsky et al., 2003). This finding parallels current trends in higher education, indicating the importance of the pivotal first year in predicting student retention (Levitz et al., 1999; Tinto, 1993).

Community college administrators and faculty are aware that retention hinges upon providing students with sufficient supports to progress academically. These supports fall into the three basic categories of academic advising, learning support, and assessment (Habley & McClanahan, 2004). Accountability for student outcomes entails creating an environment that promotes engagement (Dwyer et al., 2006; Community College Survey of Student Engagement, 2007; Kuh, 2007). The Community College Survey of Student Engagement (2007) emphasized students who enter college with inadequate academic preparation “must be more engaged to attain outcomes that lower risk students may reach with less effort. Colleges, therefore, should maximize engagement opportunities for their students who are most at risk” (Community College Survey of Student Engagement, 2007, p. 5). In response, many community colleges have developed strategies to enhance retention, the most prevalent being academic advising, learning support, and assessment (Habley & McClanahan, 2004). Of these strategies, academic support emerges as one of the most significant factors in student retention.

According to the 2005 National Survey of Student Engagement, students that attended a first-year seminar designed to advance their academic skills or social developments experienced several benefits compared to their peers. Participants were exposed to more challenging academic activities, engaged in more active and collaborative learning activities, experienced more frequent interactions with faculty, and perceived a more positive and supportive campus environment. Students reported gaining more from the first critical college year and being more satisfied with the college experience. While these experiences are advantageous to all students, they may mean the difference between dropping out and persevering toward their educational goals for students who arrive at the campus academically underprepared.

Community colleges identified by ACT as high-performing based on retention and degree completion data were found to have adopted best practices in retention to a much greater degree than low-performing institutions (Habley & McClanahan, 2004). Measures such as mathematics labs, writing centers, reading centers, individual advising interventions with specific populations, learning communities, foreign language centers, and programs for racial and ethnic minority students were implemented in these institutions. The defining characteristic of these efforts is the emphasis on academic support. Mandatory course placement testing (20.7%), tutoring programs (19.3%), and prerequisite remedial or developmental coursework (19.2%) were identified as the three most important methods for impacting student retention in community colleges.

Several recommendations to increase retention rates at community colleges were recommended by ACT researchers (Habley & McClanahan, 2004). The initial step was to designate an individual to coordinate a campus-wide planning team. This group was charged with tailoring retention strategies to student and institutional characteristics, setting short-term and long-term goals, and building evaluation into the model. The I-E-O model is apparent in this focus (Astin, 1993; Dwyer et al., 2006).

As noted previously, the term *remedial education* was used in this study to designate the basic reading, writing, and mathematical courses needed to assist students in becoming college ready. However, *developmental education* encompasses “a broad range of courses and services organized and delivered in an effort to help retain students and ensure the successful completion of their postsecondary education goals” (Boylan & Bonham, 2007, p. 2). Forms of developmental education include courses in remediation and other areas designed to promote college success skills and competencies. Examples include courses in study skills, learning

strategies, and critical thinking. Developmental activities include assessment, advising, individual and group tutoring, workshops on an array of topics, individualized instruction, and learning laboratories. These learning supports are provided by virtually all community colleges with high rates of retention (Habley & McClanahan, 2004).

### **Remedial Education**

The purpose of remedial education is to provide underprepared students with the skills necessary to successfully complete college courses and programs and gain employment in the workforce. Remedial education has been in place since the 17th century when Harvard College used tutors to assist students studying Latin (Phipps, 1998). Since that time, the increasing demand for higher education has advanced the need for remedial education. According to the U.S. Department of Education (1996), by 1995, 81% of public four-year colleges and 100% of public two-year colleges offered remediation.

Remedial education in the community college systems is a major topic in higher education. Previous efforts to eliminate remedial education in the 1990s are now showing signs of reversal. Several states are acknowledging the value of remedial education programs and recommending the establishment of best practice methods for providing this education (Boylan & Bonham, 2007). The current trend among many states is to concentrate all forms of remedial education in the community college systems. The two major reasons for shifting remediation to community colleges are that many college administrators and faculty philosophically disagree with teaching pre-college level courses at four-year institutions; and secondly, community colleges and high schools are more appropriate sites for teaching these courses. It is typically more cost effective to teach remedial education in a community college rather than a 4-year institution (Bettinger & Long, 2005).

Institutions vary regarding remedial education policies, but typically, remedial courses do not provide credits that count towards a degree or certification. Therefore, remediation often lengthens the time necessary to complete a degree, which can affect financial aid for students. Moreover, remedial courses are often required prerequisites before admission into upper-level courses or programs, such as nursing. In fact, nearly two-thirds of campuses across the nation restrict enrollment in some courses until remediation is complete (U.S. Department of Education, 1996).

Each year, thousands of students entering community college systems test into remedial education courses. These courses serve as mediators to prepare students for success in college-level reading, writing, and mathematics courses. Over the last 10 years, a greater focus on remedial education has occurred as indicated by recent research on the topic (Byrd & MacDonald, 2005; Crane, McKay, & Poziemski, 2002; Dotzler, 2003; Gilroy, 2006a; Hoyt & Sorensen, 2001). As more students apply for nursing education programs, and with the increasing diversity in colleges and universities, a greater emphasis and need for remedial education that adequately prepares students for successful completion of college courses is essential. The numbers of underprepared students continues to grow and enrollment in remedial education courses at community colleges is expanding. According to the U.S. Department of Education (2006):

. . . several national studies confirm the insufficient preparation of high school graduates for *either* college-level work or the changing needs of the workforce. Close to 25 percent of all students in public high schools do not graduate—a proportion that rises among low-income, rural, and minority students. The educational achievement levels of our young

people who do complete high school are simply not high enough to allow them to succeed in college. (U.S. Department of Education, 2006, p. 8)

The High School Survey of Student Engagement (HSSSE; 2005) indicates that students leave the educational system prematurely because they lack basic skills in writing, grammar, spelling, and math computation. The report notes that a significant number of students require “an average of one or more years of remedial coursework because they are not adequately prepared for the level of academic challenge presented in the college curriculum” (HSSSE, 2005, p. 1). Unfortunately, many students who enter college and require remedial courses often were leaving after the first year.

Parsad and Lewis (2003) found that 98% of two-year public institutions provide remedial courses in the areas of reading, writing, and mathematics and more than 40% of first year community college students participate in at least one remedial course. Further, community colleges are more likely to offer a range of remedial courses than four-year institutions. In many institutions, participation in remedial courses has become mandatory for students whose placement scores classify them as academically underprepared. However, despite the increasing number of students enrolled in remedial courses, Bettinger and Long (2005) observe that there is minimal understanding of the impact of remediation on student outcomes.

**Remedial education debate.** Several sources indicate the topic of remedial education has become a major source of debate (Boylan & Bonham, 2007; Perkhounkova et al., 2005). Grimes and David (1999) noted several factors associated with increased attention on the issue of remedial education courses needed by underprepared students. The authors cite decreasing financial resources, higher public expectations, and general negative public opinion which have

led to increasing debates both for and against provision of remedial courses in colleges and universities. According to Grimes and David, “Opponents generally argue that remedial education constitutes an unpalatable duplication of services with taxpayers paying a second time for skill development. Both proponents of the open-door policy and opponents of college remedial programs generally agree that the problem is significant and demands attention; solutions, however, remain elusive” (Grimes & David, 1999, p. 1).

Critics stress the expense of providing students with remedial education that should have previously been covered in the high school. According to the U.S. Department of Education (2006), “Some 40 percent of all college students end up taking at least one remedial course—at an estimated cost to the taxpayers of \$1 billion. Additionally, industry spends significant financial resources on remediation and retraining” (U.S. Department of Education, 2006, p. 8).

Advocates contend the investment in human capital and development of a knowledgeable, diverse, and skilled workforce is imperative to maintaining success in the global economy. According to the U.S. Department of Education (2006), “Among high school graduates who do make it on to postsecondary education, a troubling number waste time—and taxpayer dollars—mastering English and math skills that they should have learned in high school” (U.S. Department of Education, 2006, p. 7). Yet, most Americans would agree that the individual and social value and benefits associated with higher educational attainment are many. Improved quality of life through long-term economic gains, enhanced consumer health, improved tax base, retirement benefits, and increased civic participation make finding solutions to access issues to higher education are a shared responsibility (Institute for Higher Education Policy, 2005).

**Remedial English.** Bettinger and Long (2005) studied remedial education and student participation and outcomes in a community college. They found that remedial English and remedial mathematics students had different profiles and that the courses did not have the same effect on student outcomes. Strehlow (1996) focused on the impact of enrollment in a developmental English (writing) course on the academic success of students at Wilmar Community College in Minnesota. Results indicated that those completing the course had a higher GPA and had completed more credit hours than non-completers. Several variables such as age, high school GPA, years out of school, grade in last English course, and highest math course completed were all predictors of grades in college-level English composition courses.

Perkhounkova et al. (2005) examined the benefits of developmental courses using placement test scores to predict college outcomes. The study found that a B grade in developmental coursework is the benchmark for successful outcomes in college-level work and persistence in college. Strehlow (1996) found that students who earned at least a C in developmental writing significantly outperformed students who completed the course unsuccessfully with a D or an F in subsequent college level courses and earned higher cumulative GPAs. However, the analysis did not include more sophisticated analysis, which Bettinger and Long (2005) criticize for failing to present an accurate reflection of the impact to developmental courses.

Crews and Aragon (2004) examined the influence of a community college remedial education writing course on academic performance. This study was developed to examine the issue of student retention and academic performance as it related to a remedial education writing course. The study examined whether students in a remedial writing course achieved higher grades at the end of a 3-year period following initial college enrollment when compared to non-

participants. An ex post facto design was used to follow a sample (N = 669) of students for a 3-year period following initial enrollment at a community college. Results demonstrated a positive relationship between those who participated in developmental writing courses and short- and long-term academic outcomes and performance.

**Remedial mathematics.** Waycaster (2001) explored the factors impacting success in developmental mathematics courses and subsequent courses for students in the Virginia Community College System (VCCS). VCCS had recently implemented a policy of inter-institutional collaboration to formulate system-wide guidelines for developmental reading, writing, and mathematics, including measurable goals and entrance and exit competencies in the three target subjects. This endeavor entailed system-wide collaboration in standardized test interpretation, common goals, exit criteria, and evaluation methods for developmental courses. A cornerstone of accountability is the use of appropriate evaluation methods for assessing student outcomes (Millett et al., 2007; Millett et al., 2008).

To assess the effectiveness of the new developmental mathematics program, Waycaster (2001) examined the following variables: course credit hours, class size, attendance, gender of student and teacher, class participation (questions and answers), mode of instruction (lecture or individualized), success rates in developmental and subsequent college credit courses, and rates of retention and graduation among developmental students. The author identified substantial variation among the passing rates of the colleges within the VCCS ranging from 29% to 64%. According to the criteria set by Roueche and Roueche (1993), 61% to 70% represents a successful completion rate for a developmental course. Waycaster observed that 10 of the 15 mathematics groups (representing a single course each) experienced success rates of almost 50%

or higher. Two of the 5 colleges in the VCCS had success rates of 50% or higher in all 3 developmental mathematics courses they provided.

A notable finding was that most were successful when transitioning from developmental to college-level math courses. Students completing the developmental course also performed at the same level or higher in college level mathematics courses as compared to students exempt from developmental courses (Waycaster, 2001). Further, 3-year retention rates for the developmental students from across the 5 colleges were higher, ranging from 61.9% to 80.6% compared to 42.1% to 61.9% among the non-developmental students. Accounting for higher retention rates, the developmental faculty concluded:

. . . extra attention that developmental students receive in counseling, advising, teaching, and monitoring progress, as well as smaller classes, contribute greatly to this higher level of retention for developmental mathematics students. The only college . . . having a developmental class enrollment over 25 is the same college with the lowest developmental retention rates. Thus, smaller class size and special attention through advisement may be keys to retaining developmental students. (Waycaster, 2001, p. 412)

These strategies are consistent with best practices in retention for two-year institutions (Habley & McClanahan, 2004). Waycaster (2001) noted that the only developmental class with more than 25 students was in the college with the lowest retention, suggesting that small classes and individualized attention were important factors in retention. Students who had been in developmental courses accounted for 40% of the students who graduated, adding further support for the effectiveness of the developmental education. It is noteworthy that the retention rates for the VCCS institutions were unusually high for community colleges. Waycaster notes, “These

are impressive statistics, which supports the argument that developmental students do progress to complete their program or degree and do indeed graduate” (Waycaster, 2001, p. 413).

**Remedial education and student outcomes.** The need to assess the impact and effectiveness of remedial education on student outcomes is particularly important because a main function of the community college is to provide remedial courses to entering students who do not possess the basic skills needed for academic success in college-level curricula. Research on remedial programs has been broad and provided a wide range of mixed findings. Several studies have been conducted on remedial education and its impact on student success and completion rates (Lewis, Farris, & Greene, 2003; National Center for Education Statistics, 2006; Parsad & Lewis, 2003; Perkhounkova et al., 2005; Shields, 2005; Sinclair Community College, 1994). Researchers have examined the efficacy of remedial education programs by evaluating such things as course completion rates, student progression from remedial to college-level work, subsequent performance in college-level courses, and comparing the persistence rates of remedial course completers with those who fail to complete remedial course work.

Bailey and Alfonso (2005) authored a study supported by the Lumina Foundation, *Paths to Persistence: An Analysis of Research on Program Effectiveness at Community Colleges*. This report provided a critical analysis of the state of research on the effectiveness of four methods used to increase persistence and completion at community colleges. Advising, counseling, mentoring, and orientation programs; learning communities; remedial education and other services for academically underprepared students; and college-wide reform were reviewed. According to this report, developing methods to improve the effectiveness of remedial education is one of the most important and challenging issues facing community colleges today. Further, “Almost one-fifth of traditional-aged community college student’s never complete 10 credits . . .

many of the students often leave because of academic problems and, indeed, many students never successfully complete all developmental courses that are deemed necessary” (Bailey & Alfonso, 2005, p. 19). Bailey and Alfonso summarized that institutions can assist poorly prepared student through provision of “. . . extensive instruction in academic skills, advising, counseling and comprehensive support services” (Bailey & Alfonso, 2005, p. 19).

Kolajo (2004) used an ex post facto design to analyze remedial and non-remedial data from community college graduates to identify characteristics of graduates who required remedial courses and those who did not require remediation. Overall, remedial students were found to perform as well in college-level courses as those who did not require remediation. Student performance was also found to be better for remedial students in a study by the Laramie County Community College (1995) which indicated that grade point averages of remedial students were higher overall than students who did not need remedial coursework. Success rates were also found to be higher for those enrolled in remedial and later college courses. However, students required to take lower-level remedial courses had lower retention rates.

Schnuth (1988) examined the impact of remedial education on student achievement and attrition in health related fields. Over a two-year period, data for health students was collected to determine if remedial education increased student retention and grade point averages. Analysis of data revealed that, “academically deficient students who completed remedial courses were retained to a greater extent and attained higher grade-point averages than non-participants” (Schnuth, 1988, p. 194). The study also found that the highest attrition rate for all health programs occurred in the nursing department.

Hawley and Harris (2006) conducted a freshman survey of first-time students during an orientation session. The purpose was to examine characteristics that predicted retention and

attrition rates. Findings suggested that one of the strongest predictors of student attrition was the number of remedial courses required. According to the data presented, “the more remedial coursework a student has to take, the less likely that student is to persist according to our model” (Hawley & Harris, 2006, p. 130). A study by Zhao (1999) coincided with these results.

Sinclair Community College (1994) in Ohio conducted a three-year longitudinal study of the relationship between developmental education and student outcomes and retention. The study, consisting of 1,798 students enrolled in either degree or certificate programs in fall 1990, found that developmental courses had a positive impact on retention. Students completing all recommended developmental courses tended to stay in school longer, had a higher ratio of credit hours completed, were more likely to persist to program completion, and were more likely to succeed in freshman English and math than those who only took some recommended developmental courses. The main effect of developmental courses was on retention rather than academic performance. In general, students who persisted earned a C average or higher regardless of whether or not they took developmental courses. Of the 6 campus programs, allied health students had one of the three highest retention rates (about 45%), surpassing the overall retention rate of 40.4%.

Pierson and Huba (1997) explored the impact of developmental education by examining GPA, total credits earned, retention, goal attainment, certificate earned, and degree earned. In a sample of 314 full-time community college students, 3 groups were assessed: those exempt from developmental courses; those completing all recommended developmental courses; and those who did not complete at least one developmental course. The sample consisted of 60% female students, which is typical of community college enrollment (Grimes & David, 1999). Close to two-thirds (62%) of the developmental students had high school GPAs between B and C.

Outcomes for students who completed the developmental courses were comparable to students who were exempt from developmental coursework or did not complete them (Pierson & Huba, 1997). No differences emerged with respect to the total number of course credits earned, retention to the second year (for associate degree candidates), goal achievement (for students who aspired to earn a degree or transfer), and degree completion. The exempt and completer groups did not differ in mean cumulative GPA. The only distinction among the three groups was a higher GPA for students who were academically prepared at the onset. Students who completed their developmental courses did not earn GPAs higher than those with similar academic profiles who failed to complete the developmental coursework.

Pierson and Huba (1997) suggested several explanations which may be attributable to the findings that both the completer and non-completer groups were generally as successful as those who were exempt on these outcomes. First, “weaker students catch up to more capable students” (Pierson & Huba, 1997, p. 1). Second, weaker students may have received special assistance leading to a positive effect on retention and outcome measures. Finally, students needing remedial education have varying levels of exposure to it. Some may have partially completed a course while others completed only one of several recommended courses. Implications for practice focus on the importance of assessing student success and developmental education, especially in relation to other academic support services. Development of a learning environment structured to provide all students with ongoing access to specialized academic assistance would be beneficial.

Hoyt (1999) investigated the impact of remediation on retention rates among students enrolled at Utah Valley State College (UVSC) using historical data over a 5-year period from 1993 to 1998. Data showed that almost half the students entering UVSC in a given year required

remedial courses and half drop out and fail to earn a degree. UVSC is an open-enrollment college, but does require admissions testing to identify students that need remedial education. Analysis showed that as the number of remedial course needs increased, the probability of dropping out increased, particularly for students with the highest degree of academic deficiency showing the highest rate of attrition. Among students with the highest need for remedial courses, the dropout rates ranged from 64% to 72%.

Of the three areas of remedial education offered (reading, writing, and mathematics), about one-third of the UVSC students required remedial courses in more than one subject area. Subsequently, approximately 21% required 2 remedial courses and 11% needed 3 remedial courses (Hoyt, 1999). Students were weakest in mathematics, with 44% requiring remediation, followed by English (34%) and reading (12%). Students requiring remedial reading courses typically needed remediation in all three subject areas. The number of remedial courses required was inversely associated with the students' GPAs. For example, students requiring remediation in two subject areas had a first-term GPA of 2.47 versus those needing remediation in three areas with a first-term GPA of 2.30.

Hoyt (1999) identified that disabled students had the highest remedial placement rates at 72% with approximately 64% of those needing remediation in mathematics. Minorities had high remedial placement rates of 67% with 57% requiring remedial math, 51% remedial English, and 26% remedial reading. Students from lower-income backgrounds and those who worked full-time had significantly higher probability of dropping out. However, students with full-time jobs often drop out from college and eventually earn a degree although within a longer time frame.

Other student populations were identified as having high dropout rates. Minority students had higher remedial needs and were significantly more likely to drop out, with attrition

rates ranging from 73% to 77% (Hoyt, 1999). Minorities represented a small portion of the students at the predominately white (93%) campus which may impact attrition. Some suggest that the isolation and alienation reported by minority students in nurse education programs highlights the importance of the institutional environment on attrition rates (Nibert et al., 2006). First-generation students were more likely to drop out, an important concern since first-generation students can account for 80% of students at a community college campus (Grimes & David, 1999). Older working adults who attended college part-time also had higher dropout rates. Overall, the findings confirmed other research identifying insufficient academic preparation, minority status, first-generation students, employment, and other outside responsibilities (such as family obligations) as risk factors for dropping out (Hoyt, 1999).

Hoyt (1999) acknowledged that predicting student retention is a complicated endeavor due to the number of variables influencing student success. Student characteristics, commitment to earning a degree, academic variables, student financial support, employment, and other factors had varying degrees of impact on student attrition rates and success in college. Further, the study identified that first-semester academic performance had the most powerful impact on persistence. The more remedial education courses required by the student, the more likely they were to drop out of college. Financial aid was the second most powerful factor.

Hoyt (1999) identified academic preparation and financial aid as significant factors that impact attrition. Improved advising regarding financial aid resources and early interventions to deal with academic issues and provide support for students were recommended. The development of a comprehensive student support system for community college students is consistent with a comprehensive model of developmental education that provides students with a

range of academic and psychosocial supports (Boylan & Bonham, 2007). Advising plays a significant role in Hoyt's (1999) recommendations.

Developmental advising in which both student and advisor work together to foster the student's initiative and personal growth has demonstrated positive results in promoting retention among high-risk college students (Heisserer & Parette, 2002). Heisserer and Parette argue that academic advisors should be more proactive in working with students who experience academic problems. They stress the importance of intrusive advising for at-risk college students such as students who are ethnic minorities, academically disadvantaged, have disabilities, are of low socioeconomic status, and are probationary students. Intrusive advising strategies are special techniques based on prescriptive, developmental, and integrated advising models. The authors further recommend development "of a comprehensive plan that addresses intrusive advising, adequate faculty and advisor training, web supports for targeted students, development of comprehensive databases for managing student data, and ongoing research to evaluate intervention effectiveness" (Heisserer & Parette, 2002, p. 1).

Yang (2000) investigated the relationship between developmental coursework and student achievement using a population of 403 students at Harford Community College in Maryland. The study tracked the cohort of students enrolling in fall 1992 through summer 1996. Indicators of success were GPA and number of credit hours. Constant variables included gender, ethnicity, age, and the need for remedial courses. Participants were placed in four categories based on the number of developmental courses needed.

Findings revealed a familiar pattern; specifically, the more developmental courses the students took, the lower the probability of successful outcomes (Yang, 2000). Students with higher cumulative GPAs were more likely to be successful. While minority status had a negative

impact on achievement, neither age nor gender had any effect. The most pronounced pattern was that the achievement of the developmental students was strongly related to their GPA in the fifth, sixth, and seventh semesters. Yang's conclusion was that students who successfully complete their developmental courses have the same chance of achievement as their peers who were not placed into developmental courses.

Bettinger and Long (2005) used data from the Ohio Board of Regents to explore student outcomes in a longitudinal analysis of more than 13,000 first-time freshmen admitted to 19 public 2-year colleges in fall 1998. The students were tracked over five years until spring 2003. All community colleges across the state use the COMPASS or ASSET tests in the first semester to measure student skill levels in certain areas. Students were placed in remedial courses based on designated cut off scores.

The data disclosed that nearly 60% of traditional age Ohio community college students participate in remedial mathematics and close to 40% participate in remedial English (Bettinger & Long, 2005). Demographically, close to 62% of women are assigned to remedial mathematics compared to 54% of men. More than three-fourths of Black and Latino students were placed in remedial mathematics courses versus 55% of white students. Similar racial and ethnic differences emerged with respect to placement in remedial English courses (68% of minority students versus 39% of whites). Students who intended to enter a degree program were more likely to take remedial mathematics than those who did not aspire toward a degree. Students who completed an academic core in high school were half as likely to need remedial courses as those who had not completed the core.

Students who do not take the ACT have higher probability of being placed in remedial courses (Bettinger & Long, 2005). However, ACT data offer a useful mechanism for comparing

students who were or were not required to take remedial courses. Students assigned to remedial mathematics earned lower high school GPAs in the subject, took fewer semesters of high school mathematics, and performed lower on both the overall ACT and the mathematics portion. The trend was analogous for students assigned to remedial English and students aspiring to earn a degree.

Among students who enrolled in remedial courses, roughly two-thirds completed their first semester with female students more likely to do so than male students (Bettinger & Long, 2005). Demographically, white, Asian, and younger students were most likely to complete the remedial courses. Students who took the ACT were also more likely to complete the courses. Additionally, students who completed the remedial courses entered college with higher ACT scores, more semesters of high school English and mathematics, and higher GPAs in both subjects.

Outcome measures showed that students assigned to remedial courses did not do as well as their exempt peers (Bettinger & Long, 2005). Full-time students placed in remedial courses earned an average of 5.4 credit hours less than academically prepared student's and had higher probability of dropping out without earning a degree. They had lower probability of transferring to a four-year institution, and, by 2003, were less likely to have earned an associate or baccalaureate degree.

Bettinger and Long's (2005) comparison of two general groups of students with dissimilar characteristics, those who needed remedial courses, and those who did not found that remediation had a negative impact on the student. Consistent with Astin's (1997) call to consider student input variables in analysis of student outcomes, Bettinger and Long (2005) conducted another comparison, this time controlling for student background factors. Matching

students with similar characteristics revealed that the need for remedial education did not have a negative impact on the students. Furthermore, students assigned to remedial mathematics had a 15% higher probability of transferring to a four-year institution than students with comparable academic backgrounds who attended community colleges that did not have remedial placement requirements and were often found to have improved student outcomes. Taking remedial English demonstrated no conclusive positive or negative impact on students.

Bettinger and Long (2005) concluded that while “remediation does not have negative effects on students, one might have expected to find a greater number of positive effects” (Bettinger & Long, 2005, p. 25). They suggest that for some students placement in remedial courses might have an adverse effect by conveying a negative message that the student is not suited for college. At the same time, completing remedial courses raises a student’s chances of fulfilling their degree aspirations. The authors suggested development of student support systems to help increase the number of students who complete degrees.

Grimes (1997) argued that insufficient attention is given to psychosocial variables in research on developmental education. This study examined factors impacting the success of underprepared students, including age, gender, ethnicity, learning-study strategies, locus of control, self-esteem, continued enrollment, course completion, and GPA. The research focused on gaining a better understanding of the relationship of these variables to students' entry academic preparation and completion. In her research, Grimes observed that internal locus of control was a key contributor to the success of underprepared students. Furthermore, underprepared students demonstrated a greater external locus of control “indicating a perception of less control over their environment and less responsibility for taking action” (Grimes, 1997, p. 1).

Bailey et al. (2005) utilized individual level data from the National Educational Longitudinal Study of 1988 and institutional level data from the Integrated Postsecondary Education Data System (IPEDS) to examine the impact of individual and institutional characteristics in predicting the success in community colleges. The author's note that although this approach is prevalent in K-12 educational research and has a growing presence in the literature on four-year colleges and universities, few researchers have investigated the influence of institutional attributes on the academic outcomes of community college students.

The main finding for institutional influences was size. That is, as the size of the institution increases, the probability of graduation declines (Bailey et al., 2005). This effect is continually reported in K-12 research. According to Tinto's (1993) model, a smaller school should foster academic and social integration more effectively. Bailey et al. (2005) suggested that the more personalized environment and services at a smaller campus would probably be advantageous for the traditional-age students in the NELS:88 sample. At the same time, learning communities can help promote integration among student's at large community colleges (Boylan et al., 2005). There are strategies for creating a supportive, personalized atmosphere even on a large campus.

Individual characteristics exerted more influence on degree completion than institutional factors, supporting Astin's (1997) emphasis on input variables. Bailey et al. (2005) suggested that students entering college with good academic preparation and adequate financial resources will probably succeed at various institutions, which is Astin's point on why outcomes data can be misleading. In contrast, students who are dealing with challenging personal circumstances may struggle regardless of the institutional profile (Bailey et al., 2005). Perin (2006) argued that community colleges serving economically disadvantaged minority students should have an array

of support services including counselors with expertise in working with that particular population mirroring findings from other studies.

Bailey et al. (2005) emphasized that it is easier to gather and analyze precise data at the individual level. Institutional attributes are often ambiguous and may or may not reflect best practices. In fact, some sources maintain that high rates of attrition are due to colleges' unwillingness to implement best practices in retention (Habley & McClanahan, 2004; Levitz et al., 1999). Those colleges that do adopt best practices typically have retention rates that far surpass expectations for their institutional type and population.

In a project sponsored by ACT, Perkhounkova et al. (2005) explored the benefits of developmental courses on students' success in specific college-level courses and overall college persistence. The study was undertaken from a "value-added" perspective, namely whether underprepared students gain advantage from taking developmental courses, and if they do, to what extent. The premise was that for students with certain placement test scores who completed remediation, the probability of success and retention would be higher. Data were derived from two large Midwestern universities that assigned students to developmental English and mathematics courses on the basis of institutional placement test scores and ACT scores. Although the school used additional criteria, only student ACT scores and GPA were analyzed.

Findings from both universities revealed that simply taking developmental courses did not have the same benefits as it did for those who both took the courses and earned a B or higher. Those earning a B or higher were more likely to perform well in college-level courses and persevere toward their degree than other students with comparable academic preparation (Perkhounkova et al., 2005). Perkhounkova et al. noted that their study expands on prior research by including developmental course *grades*, not only that students had attended the

course. The *grade* in a developmental course proved the strongest predictor of future success, both in terms of performance in college credit courses and in persistence. Simply completing a developmental course with a grade of C did not necessarily mean the student was ready for college-level course work.

Perkhounkova et al. (2005) recommended using their methodology to evaluate the degree that developmental courses are fulfilling their aims, comparing different developmental courses, and assessing the value of tiered developmental programs. Implementing policies that require high passing grades in developmental courses may be beneficial to student success. The researchers argue that, if research from other institutions supports their findings, attaining a high grade in a developmental course should be a prerequisite for progressing to college-level coursework. Long and Amey (1993) utilized Astin's (1993) input-environment-output model to examine variables predictive of student success in a community college system. This study identified that completing the highest level of developmental course was a pivotal factor in students' success. Perkhounkova et al. also emphasized that their findings dispel the prevalent assumption that obtaining a C in a developmental course implies a student is ready for standard coursework.

**Remedial education at Ivy Tech Community College.** Ivy Tech Community College has statewide standards to distinguish between remedial and college-level work. Like most community colleges, Ivy Tech degree-seeking students are required to take placement exams at the beginning of their freshman year (Ivy Tech Community College, 2008a). Over the years, Ivy Tech has used both the COMPASS, a computer-based exam, and the ASSET, a paper-pencil based exam; both exams are published by ACT, Inc. Placement tests consist of a variety of sections that measure students' skill levels in reading, writing, and mathematics. Designated cut

off scores are in place indicating which, if any, remedial courses a student is required to take before beginning college-level work.

Placement scores are based on historical information of how Ivy Tech students do in subsequent classes and are reviewed periodically. Ivy Tech Community College (2007a) utilizes American College Testing products, either the ASSET (paper-based) or COMPASS (computer-based) exams to determine reading, writing, and mathematics skills for all degree-seeking students upon admission to the college. Statewide placement scores are consistent among all campuses. Other assessments such as the ACT or SAT can be substituted in place of the ASSET or COMPASS exams and students may be waived from remediation based on those test scores. Students required to take remedial courses must successfully pass each course with a “C” or better to progress to the next higher course. Students may also retest on the ASSET or COMPASS and score high enough to test into college-level courses.

Ivy Tech Community College delivers remedial education coursework through the Department of Academic Skills Advancement. Six courses in the areas of reading, writing, and mathematics will be examined in this study and account for the majority of all activity. The two courses offered in reading are ENG 031 Reading Strategies for College I and ENG 032 Reading Strategies for College II. Two writing courses include ENG 024 Introduction to College Writing I and ENG 025 Introduction to College Writing II. The two levels of remedial mathematics include MAT 044 Mathematics and MAT 050 Basic Algebra. Although a lower-level Mathematics course (MAT 040) is an option, students testing into this level are often referred out for further remediation before retesting at Ivy Tech. Therefore, this level was not explored in this study.

According to recent numbers, 59% of all students attending as of the fall term 2006 Ten Day Count had enrolled in one or more skill advancement courses at some point during their tenure at Ivy Tech. Furthermore, approximately 7 out of 10, first-time college students, who have just entered Ivy Tech as degree-seeking students enrolled in one or more math or English remediation courses. Of these students, full-time students (71%) were more likely than part-time students (63%) to need remediation (Ivy Tech Community College, 2007b).

Ivy Tech Community College (2007a) data on remedial courses reveals that enrollment has “risen from 45,847 in the 2002-03 academic year to 52,556 in the 2005-06 academic year, an overall increase of 14.6%” (Ivy Tech Community College, 2007a, p. 6). The majority of this growth is seen in students taking remedial math. Four regions in the state accounted for half of the remedial enrollment during the 2005-06 academic year including Indianapolis, Ft. Wayne, Muncie, and Gary. Although remedial student numbers are high in these four regions, each region across the state has a significant number of remedial education students. Since the 2002-03 school year, the most dramatic increases are noted in the Indiana cities of Richmond (70%), Kokomo (50.4%), and Bloomington (47.5%).

The demographic profile of students taking remedial courses at Ivy Tech Community College (2007b) indicated that for the fall 2006 term, remedial students were significantly more likely to be African-American women between the age of 15-19 years. The percentage of remedial students who successfully completed courses with a grade of A, B, or C ranged from 52% to 65% statewide. For those in two remedial mathematics courses, successful completion rates ranged from 53.3% to 62.7%, which was found to be lower than remedial students in the four remedial English courses.

The scope of remediation on average accounts for 25% of the total student population and 13.3% of the FTE (Ivy Tech Community College, 2007a). Of those students who enroll in remedial education courses, 57.4% completed the course successfully earning a grade of A, B, or C. Approximately 13.4% withdrew prior to completing remedial course work.

### **Associate Degree Nursing Programs**

In the face of a serious nursing shortage, the California ADN Project was formed as a collaborative effort involving academics, educational researchers, and analysts from the Center for Student Success (CSS) at City College of San Francisco (Phillips et al., 2002). An expert team from the CSS was organized to work in close alliance with the ADN consortium of community college nursing directors and the Chancellor's Office of the California Community Colleges (COCCC) Economic Development Program's Health Care Initiative for the purpose of the research analysis.

The researchers explored the prospective application of several models of student retention to the research project including Astin, Tinto, Bean, and Pascarella and Terenzini (Phillips et al., 2002). Ultimately they decided that Cross' model, which focuses on adult learners, was the most appropriate for their population. According to Cross' model, the environmental or institutional factors that have the most relevance include those that might pose a barrier to completion for adults with multiple responsibilities such as inconvenient scheduling or location of requisite classes and course load. The model also included mandatory courses or skills required for entry into a program.

The study utilized data from all 5,007 students who entered ADN programs from fall 1994 through 1999 (Phillips et al., 2002). The model showed that certain sociodemographic features predicted greater probability of program success although the differences were not large.

Gender had an effect on program completion; the success rates for female and male students were 78% and 70%, respectively. Students whose native language was English were more successful (78% versus 70%). The most successful age group was expansive, ranging from 20 to 44 years. This finding reflects the high proportion of students entering nursing as a second career and illustrated that adults who chose to pursue a nursing career had a good chance of successful graduation (Goodin, 2003).

The difference between success rates for native English-speakers and non-native English speakers reported by the California study (Phillips et al., 2002) is similar to the findings of Sims-Giddens (2002) for ADN graduation rates among nursing students whose primary language was English and Mexican American nursing students. In terms of graduation, 60% of the Mexican American students successfully completed the ADN program versus 69% of native English speakers. However, there was a marked gap in performance on the NCLEX-RN. Nearly all (94%) of the native English speakers passed the licensure examination compared to 73% of the Mexican American students. This finding highlighted the importance of bolstering support programs and services to expand recruitment and retention of cultural and linguistic minority students (Nibert et al., 2006).

Several recommendations arose from the California community college initiatives. Findings indicated that nursing programs with higher rates of on-time graduation and lower rates of attrition and delayed graduation served fewer student's, provided a range of support programs and services for all nursing students, and tailored services to meet diverse students (Seago & Spetz, 2003). Demographically, these programs also had lower proportions of black and Asian non-Filipino students.

Seago and Spetz (2003) noted that other researchers have reported students who attain higher grades in certain prerequisite courses are more likely to graduate on time and less likely to drop out. In nursing programs, as in the general college population, previous academic performance in terms of higher GPA is a key predictor of program success (Schwarz, 2005; Stuenkel, 2006). First-time pass rates on the NCLEX-RN were higher in nursing programs at colleges not offering remedial programs and services (Seago & Spetz, 2003).

Seago and Spetz (2003) recommended that ADN programs reserve a portion of their admissions slots to students who display the highest performance in prerequisite courses. They suggested giving weight to other criteria such as prior work experience and community service. At the same time, the authors did not deny the merit of providing support services for academically underprepared students. They recommended remedial education and tutoring services as well as English as second language (ESL) programs. Seago and Spetz gave high priority to making nursing programs hospitable to culturally and linguistically diverse students. They advocated training for faculty and students in areas such as cross-cultural communication, techniques for identifying students who may be at risk, counseling and mentoring programs, and unbiased course materials and examinations. Furthermore, they recommended that the training be extended to all community college faculty rather than limited to nursing faculty.

### **Diversity, Attrition, and Nursing Student Success**

Boylan et al. (2005) are staunch advocates of diversity initiatives on community college campuses. The recommendations of Seago and Spetz (2003) are congruent with their vision of a comprehensive developmental program that appreciates diversity. Validating the experiences reported by minority nursing students (Nibert et al., 2006), Boylan et al. (2005) recommended strategies for teaching students to cope with racism. Mentoring is a component of developmental

education that is widely recognized to be valuable for all students (Boylan & Bonham, 2007; Boylan et al., 2005; Habley & McClanahan, 2004).

Sandiford and Jackson (2003) investigated attrition in an ADN program using a model synthesized from Tinto's interactionalist model, Bean's student attrition model, Bean and Metzner's non-traditional undergraduate model, and Stahl and Pavel's community college retention model. Their study took place in a Florida community college, a system that has been aggressively expanding its nursing programs to meet the state's healthcare demands (Medlyn, 2000). Mirroring other national trends, the ADN program was attracting more non-traditional and minority students (Sandiford & Jackson, 2003).

The attrition rate for the first semester was 41%, surpassing the national average of 29% to 35% (Sandiford & Jackson, 2003). Placement testing disclosed that 65% of the entering students required remediation in reading and 47% required remediation in writing. The model revealed a predictable pattern: students' prior GPA was inversely related to the probability of failing a course. Attrition was lower for students evaluated at college-level language and who entered the program with a GPA of 2.5 or higher. Nearly 80% of the students assessed at college-level language proficiency passed the first semester nursing course compared to 52.9% in need of language remediation.

SAT verbal scores have been found to predict success on the NCLEX-RN (Schwarz, 2005). The pattern observed by Sandiford and Jackson (2003) may be viewed as a precursor. Given the critical importance of college-level language competence on first-semester attrition, Sandiford and Jackson declared that all nursing students should be assessed (usually mandatory) and students in need of remediation should be immediately given intensive reading or language

intervention. Furthermore, they stated that students should not be allowed to advance in the nursing program before demonstrating college-level language skills.

Sandiford and Jackson (2003) claimed there is a need to align first-semester textbooks and other reading materials with students' reading proficiency to facilitate successful completion. They also propose that a minimum admission GPA of 2.0 is too low and should be raised to 2.5 or 3.0 if there is empirical support for it. According to the authors, research would have to demonstrate that the retention rate of students with higher GPAs outweighed the prospective loss of students admitted to the program under lower admission criteria who might be successful.

Sims-Giddens (2002) found similar results for ADN graduation rates among nursing students whose primary language was English. When compared to Mexican American nursing students, native English language students had higher nursing program completion (69%) versus the Mexican American students (60%). There was, however, a significant difference in NCLEX-RN pass rates between the groups. Nearly 94% of the native English speaking graduates successfully passed the licensure examination as compared to 73% of the Mexican American students. This finding highlights the need for student support services to attract and retain minority students (Nibert et al., 2006).

Perin (2006) investigated the academic progress of nursing students at a community college with a large Latino population. Mirroring the national trend for hot programs (McPhee, 2004), nursing was the most popular major with 19% of new students aspiring to an ADN. The student composition was 51% Latin and 34% Black, with most being first-generation college students. The ethnic composition of the nursing students paralleled that of the overall student body. Of the nursing student population, 10% were males, exceeding the proportion of men in professional nursing practice (Goodin, 2003). Students under 20 accounted for 46% or the

nursing students with most in the age range of 25-29 years old. The majority of students were attending college full-time.

Three-year retention rates were quite low for all students: 31% of the nursing students remained after 3 years versus 24% of students in other programs (Perin, 2006). Some 8% of the nursing students had switched to another field of study. Overall, the nursing students were more likely to have remained in school after 3 years (41% versus 34%) although they were slightly less likely than students in other areas to graduate on time or after three years.

Eighty-one percent of the nursing students enrolled in at least one remedial course (Perin, 2006). Contrasting nursing students who completed the nursing program with those who were not successful, those who completed or were progressing in the program, were more likely to complete remedial courses while unsuccessful students were more likely to drop out. No demographic or academic variables were found that could distinguish between those who were or were not successful. However, science courses were a stumbling block for many. This finding is problematic given the relationship noted in previous studies between science grades and NCLEX-RN success (Potolsky et al., 2003; Stuenkel, 2006; Waterhouse & Beeman, 2003).

Potolsky et al. (2003) described a tutoring intervention adopted by a BSN program for first-semester students enrolled in pharmacology and pathophysiology courses. However, the students performed better in the requisite science courses than in the target courses. Potolsky et al. propose that the decline in performance might have resulted from difficulty making the transition from the focus on knowledge retention in the prerequisite science courses to the clinical application of knowledge in the nursing courses. For the community college students, Perin (2006) surmised that the difficulty with the nursing science courses (pharmacology and biology) was due to inadequate preparation in science and mathematics.

Perin (2006) advocated an intensive development program tailored specifically to nursing students. The plan might include tutoring in biology, pharmacology, and other challenging subject areas augmented with advisement and counseling services by personnel with expertise in meeting the needs of the particular population served by the community college. Perin also recommends the use of learning assistance centers, noting that these are frequently underutilized. In a prior study exploring the presence of learning assistance centers at 15 community colleges, there were some reports that students who visited the learning center more frequently earned higher GPAs (Perin, 2004).

Perin (2004) proposed that students who are more determined to persist may visit the learning center more often to assure they achieve their goals. With regard to the high dropout rate among the community college nursing students, Perin (2006) emphasized the paradox in a situation where the society faces a serious nursing shortage and students view nursing as an attractive career, but fail to complete the requisite program. The author's recommendations for combating high levels of attrition were largely consistent with those of Seago and Spetz (2003).

### **NCLEX-RN Preparation**

Several factors have been identified as strong links to NCLEX-RN success: SAT verbal scores; grades in physiology, pathophysiology, second junior nursing courses, and first senior nursing course; sophomore GPA; and graduation GPA (Schwarz, 2005). Higher critical thinking skills and low test anxiety have also been related to higher NCLEX-RN pass rates. Broadly, these last two factors are addressed by remedial education programs (Boylan & Bonham, 2007).

Barkley et al. (1998) developed the Risk Appraisal Instrument (RAI) for use in predicting pass or fail scores on the NCLEX-RN. Using this tool at a large Southeastern university, the RAI accurately classified 95.5% of graduates who passed the NCLEX-RN and 76.2% of those

who failed. Variables with the strongest predictive power included the student's GPA in clinical and nursing theory courses and the National League for Nursing (NLN) Achievement Test Scores. These conform to the earliest identified predictors of success on RN licensure examinations (Nibert et al., 2002).

Waterhouse and Beeman (2003) tailored the RAI to the University of Delaware nursing program, calling the new assessment tool the Delaware Risk Appraisal Instrument (DRAI). However, the new instrument was less accurate than the original RAI. As a strategy for simplifying the prediction of students' performance on the NCLEX-RN, Waterhouse and Beeman recommended using the grade of C or lower on nursing courses as a warning signal. Previous studies have found C grades in nursing courses associated with failure on the licensing exam.

Stuenkel (2006) examined six classes of graduates taking the NCLEX-RN between December 1997 and March 2001 to identify factors related to pass rate success. Data encompassed pre-admission information, nursing examination scores, and grades in theory courses. The overall pass rate was 77% for the sample of 312 students. Stuenkel identified the best single predictor of successful NCLEX-RN pass rates as standardized test scores on the NLN Community Health Achievement Test. The analysis confirmed the predictive power of standardized test scores, although the test scores were more effective for targeting students likely to pass the licensure examination than those who risked failing. The conjunction of high school GPA and pre-admissions examination scores effectively classified 80% of the students for potentially passing or failing. GPA alone was insufficient for predicting exam failure.

Stuenkel (2006) noted that SAT scores were not prerequisite for admission into the programs. Consequently, SAT scores were available for only a small proportion of students.

However, when fed into the analysis, SAT total scores produced a more accurate classification of two-thirds of the students who failed. Other researchers have found that SAT verbal scores are important predictors of NCLEX-RN performance (Schwarz, 2005). To raise first-time pass rates, Stuenkel recommended early identification and intervention for students at risk for failure on the basis of pre-entry criteria. It was proposed that students be reassessed at the halfway point in the curriculum utilizing entrance qualifications, nursing course grades, and cumulative achievement test scores as criteria for determining whether they warrant remediation.

Sayles et al. (2003) examined data from a class of nursing students enrolled in an ADN program who graduated in spring 2001. Six factors were identified as significantly impacting pass rates on the NCLEX-RN. The higher the students' scores on the Nurse Entrance Test (NET) composite, mathematics, and reading comprehension, the more likely they were to pass the NCLEX-RN. A similar finding was noted regarding GPAs. Further, students with higher pre-RN examination scores were more likely to pass the exam. Ethnicity was the only demographic characteristic found to have a significant effect. Minority students were less likely to pass the exam than white students. This pattern underscores the need for programs that address cultural diversity in nursing (Seago & Spetz, 2003) and remedial education (Boylan et al., 2005).

Regarding intervention strategies, Sayles et al. (2003) suggested considering individual characteristics such as learning styles, test-taking skills, social interaction profiles, and stress level profiles in addition to academic achievement scores. This holistic model addresses the psychosocial attributes often excluded from other models (Grimes, 1997; Grimes & David, 1999). Grimes (1997) proposed including locus of control assessments related to the powerful impact it has on persistence in academically underprepared students.

Sifford and McDaniel (2007) reported on a remediation program for senior students identified as at risk for failing the NCLEX-RN according to their performance on the E2. The specially designed program focused primarily on test-taking strategies, time-management skills, and techniques for managing test anxiety. The intervention proved to be effective. However, the authors contend that greater remediation efforts will be needed to diminish the gap between students who enter nursing school with marginal academic qualifications versus those with higher competency levels. Establishing higher standards for minimum levels of competency was recommended. Perin's (2006) study exemplified this point. The nursing students clearly required intensive and individualized assistance and support.

### **Astin's Input-Environment-Outcomes Model**

This study employed Astin's (1993) Input-Environment-Outcome model of college student development as a method for examining the impact of remedial education on associate degree nursing student outcomes. Astin's I-E-O model was developed as a framework for assessments in higher education. The basic premise for using this model was that educational assessments are not complete unless the evaluation includes information on student inputs (I), the educational environment (E), and student outcomes (O) (Astin, 1993).

Astin's (1993) model has been used in a variety of studies to investigate the impact of remedial education on persistence of academically underprepared community college students (Campbell & Blakey, 1996; Long & Amey, 1993; Zhao, 1999). According to this model, students are in a constant state of change and growth. The focus becomes one of identifying and understanding the impact of college attendance on individual development. Based on this premise, this study sought to identify what impact remedial education has on nursing student success. Assessment upon admission is typically mandatory at community colleges although

policies vary as to whether students who perform poorly on the COMPASS, ASSET, or other measures are required to take remedial courses (Bettinger & Long, 2005). With a single institution as the unit of analysis, the environment is stable therefore the outcome is an interaction between student characteristics and the environment (Dwyer et al., 2006).

**Inputs, environment, and outcomes.** Astin's (1993) model placed emphasis on three elements: inputs; environment; and, outcomes. *Inputs* encompass characteristics of the students at time of entry into the college. These include sociodemographic characteristics and students' prior academic performance. High school GPA, standardized test scores, class rank, rigor of high school courses, and other academic factors can exert a direct effect on college outcomes (Dwyer et al., 2006). The importance of student input characteristics in providing an accurate assessment of institution performance is a key component of Astin's (1997) research. He argued that focusing only on outcomes such as retention, transfer rates, or standardized test performance provides a one-sided and misleading portrayal. Levitz et al. (1999) noted that some institutions are known for innovative student-centered programs that effectively raise their retention rates by *engaging* their students, leading to more positive student outcomes (Community College Survey of Student Engagement, 2007; Kuh, 2007).

Astin's (1993) model demonstrates that the college environment can also impact student outcomes. *Environment* encompasses the variables to which the student is exposed during college. Levitz et al. (1999) were intrigued by the differences in attrition rates among institutions of similar type with comparable academic criteria. Community colleges in this category place strong emphasis on services that support academic achievement (Bailey & Alfonso, 2005; Habley & McClanahan, 2004).

*Outcomes* are the characteristics of the student after exposure to the environment.

According to this model, "outcomes," or student characteristics after exposure to college, are thought to be influenced both by student characteristics before and at time of entry to college (inputs) and by various educational experiences (environments) such as remedial education in which students interact while in college (Astin, 1993). Hoyt (1999) indicated that a variety of factors are involved in understanding the connection between remedial education and student outcomes. However, many conceptual models of student persistence were formulated to capture the experience of traditional students pursuing a four-year degree versus the two-year associate degree student (Bailey & Alfonso, 2005). Astin's Input-Environment-Outcome model of college student development offered a method for examining the relationship between participation in remedial education and student success in associate degree programs.

**Inputs.** Astin (1993) developed an interesting analogy to understand the importance of inputs and their effect on student outcomes. In this analogy, Astin compared the college student to a medical patient. In this sense, the student (patient) is admitted to the college (hospital) for an education (treatment). Typically, medical treatment (education) is administered based on an assessment, patient history, and diagnosis. With this information, we can make a better prediction of how the patient (or student) will respond to prescribed treatment.

Similarly, students seeking admission to the college and the nursing programs go through a mandatory assessment although policies vary as to whether students who perform poorly on assessment exams (COMPASS, ASSET, or other test) are required to take remedial courses (Bettinger & Long, 2005). Astin (1993) asserted that other input data such as a student's age, gender, or ethnicity may impact the outcome (learning). Placement of students in remedial courses (treatment) is based on assessment of basic skills on admission. A change in educational

outcomes (prediction) based on the experience of taking remedial courses is analogous to a change in a patient's condition based on medical treatment effects. While not all patients will respond to the prescribed "treatment", it is predicted that symptoms will improve. Similarly, students exposed to needed remedial courses are predicted to demonstrate change from admission to completion of the program of study.

**Environment.** One step in the initial admission process to the college and a prerequisite for admission into nursing programs at Ivy Tech is for students to take a placement test in reading, writing, and math. This consists of taking either the ASSET (paper-based) or COMPASS (computer-based) exams. Statewide placement scores are used to determine if degree-seeking students need remedial education courses before admission into the nursing program. Completion of previous college courses or appropriate SAT or ACT scores may waive students from placement testing. Students testing into remedial courses must demonstrate successful completion by "achieving a C or better in the course they are taking to progress to the next higher course" (Ivy Tech Community College, 2007a). Students may also opt to retest in one or all areas to try and achieve high enough scores to advance placement beyond remedial courses.

**Outcomes.** Outcomes following a program of study may be a measure of growth or change related to the environment. Remedial education constitutes the environmental aspect of this study. Analysis of environmental exposure focused on the number and types of remedial courses taken or not taken by ADN students. Examination of remedial courses taken or not taken will provide insight into whether remedial education affects the outcomes of this study (final cumulative grade point average and first-time pass/fail NCLEX-RN examination scores). Astin (1997) asserted that "if certain outcomes are facilitated by the experience of attending

college, the likelihood of such outcomes should be greatest for those students who have the greatest exposure to the college environment” (Astin, 1997, p. 25). According to Astin’s (1993) theory, an environmental effect would occur when students who took remedial courses demonstrated a different outcome than students not exposed to remedial coursework. Therefore, greater exposure to the college environment should produce a greater effect on outcome measures.

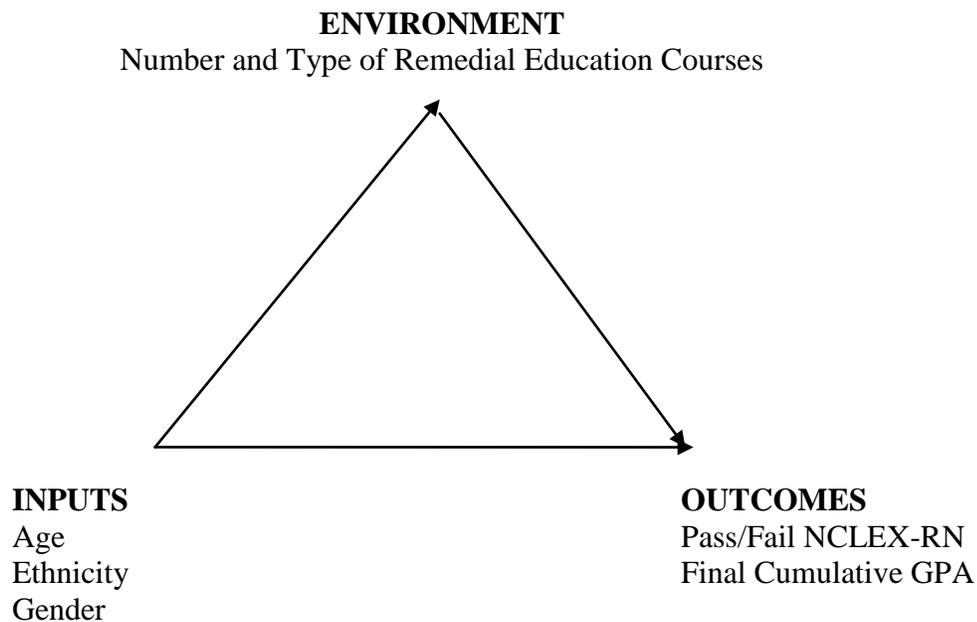
Astin (1997) recognized that certain environmental factors, such as area of study, may have a greater impact on retention than student inputs. Perin (2006) identified that among students entering an ADN program, 40% were found to have changed majors to a non-health field after three years in college. Perin further noted that, “In comparing graduation and major-switching outcomes for nursing aspirants and others, it must be borne in mind that some degree programs are more difficult than others . . . nursing is particularly difficult, being science-intensive and externally regulated” (Perin, 2006, p. 667).

Research has identified that science grades are important contributors to nursing student persistence (Potolsky et al., 2003; Spahr, 1995) and success on the NCLEX-RN examination (Stuenkel, 2006; Waterhouse & Beeman, 2003). Based on Community College Survey of Student Engagement (2007) data, strong academic support the first semester of college will enhance future success. Astin (1997) mirrors this finding and asserts that an environment that supports students’ growth and development should motivate student to seek out necessary resources to enhance success and achievement of desired goals.

Astin (1993) identified a correlation between the environment and an outcome which may reflect the effect of an input characteristic rather than the environment. Therefore, it is important to eliminate as much of this bias as possible by controlling for input variables. For the

purposes of this study, inputs included demographic variables of age, gender, and ethnicity at time of entry to Ivy Tech Community. This information was statistically analyzed to obtain predictability scores on each outcome. Only those variables that are statistically significant to the prediction were included in the equation.

Cognitive outcomes of final grade point average and NCLEX-RN first-time pass rates were chosen for evaluation due to their relevance to the educational objectives of students, faculty, and college administrators of successful program completion, licensure, and ability to practice as a nurse. Astin (1993) noted that particular outcomes tend to be associated with particular inputs. The question then becomes, does remedial education impact/change the prediction of how the student will develop?



*Figure 1.* Application of Astin's (1993) I-E-O Model

**Research using Astin's (1993) I-E-O model.** Astin (1997) suggested longitudinal studies that examine student input attributes when calculating institutional accountability on the

basis of student outcomes. Campbell and Blakey (1996) used Astin's model to study early remediation on the academic performance and persistence of underprepared community college students. The study focused on identifying characteristics predictive of student persistence. The sample consisted of students entering a Midwestern, suburban community college who were required to take the ASSET battery exam to assess reading, writing, and mathematics skill levels. Those whose scores fell below an established level were encouraged to take remedial courses in those areas, although it was not mandatory. Of the 3,282 students in the study, those who scored above the cut off point in all three areas of the ASSET were defined as college-ready. Those scoring below the cut off were classified as underprepared.

For students with low scores on all three ASSET tests, early remediation consisting of remedial coursework during the first year combined with degree aspirations proved the strongest predictors of persistence (Campbell & Blakely, 1996). For underprepared students, cumulative GPA and the number of remedial courses needed directly impacted persistence. Age, gender, and ethnicity demonstrated indirect effects through their influence on cumulative GPAs.

Overall, the I-E-O model accounted for 19% of the variance in explaining persistence among the underprepared students. Campbell and Blakey (1996) noted that students who enter college underprepared often devote a great amount of time to remedial coursework. Nonetheless, early remediation led to the same probability of success and persistence for these students as others who were more academically prepared, albeit at a slower pace.

Long and Amey (1993) utilized the I-E-O model to investigate underprepared students at Johnson County Community College in Kansas. A total of 313 students identified as underprepared based on ASSET test scores and placement in remedial reading or English courses were used for this study. Of these students, 60% successfully earned a degree or certificate or

completed 24 credit hours. Two input factors distinguished those considered successful and those who were not based on program completion or credit hours earned. First, students considered successful had reading and writing scores on the ASSET test that placed them in the highest level remedial course offered in that subject area. Second, successful students had higher high school GPAs. The two groups were further distinguished by the outcome factors of completing the highest level of remedial course work and earning a higher non-remedial credit course GPA.

The single environmental factor contributing to the outcome was the number of first-term credit hours completed. Successful completion of the highest level of remedial English courses was found to be a significant contributor to student persistence, leading Long and Amey (1993) to conclude that remedial course should be mandatory for students in community college systems that are academically underprepared. The authors recommended a “developmental semester” for students whose ASSET scores indicate the need for remediation. These students would be involved in a learning community which fostered academic and social integration. Researchers have supported the effectiveness of learning communities in promoting retention among community college students (Bailey & Alfonso, 2005; Bailey et al., 2005; Habley & McClanahan, 2004; Perin, 2004).

Zhao (1999) used Astin’s (1993) model to study retention among underprepared students at Prince George Community College in Maryland. Participants included 1,249 degree-seeking candidates who began studies in fall 1994 and classified as academically underprepared in one or more areas of reading, writing, and mathematics. Students were identified as “achievers” if they completed a degree or certificate, transferred to a baccalaureate program, or earned at least 30 credits with a cumulative GPA or 2.0 or higher by the end of summer 1998.

Findings mirrored those reported by Long and Amey (1993) and Campbell and Blakey (1996). Overall, the number of credit hours completed, cumulative GPA, positive academic standing, and race or ethnicity demonstrated variable impact on academic persistence (Zhao, 1999). Campbell and Blakey noted that a variety of factors involved in the progress of underprepared community college students may exist that are not captured by the I-E-O model. However, Zhao defended the use of Astin's (1993) model, noting that there were uniform measures such as GPA, course load, and academic standing which allowed for its effective utility. Additionally, with the trend toward mandatory placement in remedial courses, GPA points and course credits signify upward advancement from non-credit remedial courses. The only input factor in the logistic regression model that impacted outcomes was race, with white students performing better in remedial and college credit courses than students of color. Factors most predictive of student achievement were primarily academic (Zhao, 1999). Both studies strongly advocated the need for developmental programs that promote underprepared student success and persistence.

Kelly (1996) applied the I-E-O model to student persistence at the U.S. Coast Guard Academy. Using a sample of 619 cadets from the 1991 and 1993 classes, Kelly identified academic performance as the most powerful factor affecting persistence. Scores on aptitude tests particularly SAT mathematic scores and Cadet Candidate Evaluation Board scores (analogous to evaluation for admission into nursing programs) predicted academic performance and student persistence. According to Schwarz (2005), SAT verbal scores have been found to predict NCLEX-RN success for nursing graduates.

Luoma (2003) conducted a study to examine admission, progression, and end-of-program predictors of success on the national licensure examination for practical nursing (NCLEX-PN)

using Astin's (1993) conceptual framework. Admission inputs included high school or college grade point averages (GPAs) and a standardized admission examination. Environment consisted of end-of-semester GPAs, cumulative and nursing cumulative GPAs and an exit examination. The outcome variable was the NCLEX-PN licensure examination passing or failure score. Using logistic regression, findings indicated that standardized examinations were the only statistically significant predictors of NCLEX-PN success. The study was limited by small sample size, few predictive variables, convenience sampling, and use of one college for data, thus, limiting generalizability.

### **Summary**

Community college enrollment continues to increase (National Center for Education Statistics, 2004). However, the number of students successfully completing a formal degree or technical certificate in the community college systems is approximately 50% to 60% (Hoachlander et al., 2003). As enrollment continues to increase, a corresponding increase in the number of academically underprepared students is apparent. According to recent studies, increase in at risk students affects retention rate in higher education programs (Johnson & Kruezer, 2001).

The challenge of academically underprepared students is not new to higher education. As open enrollment institutions, community colleges continue to serve a high proportion of students who begin their studies with inadequate preparation for college level academic coursework (Bailey & Alfonso, 2005; Bailey et al., 2005; Bettinger & Long, 2005; CCSSE, 2007; Grimes, 1997; Grimes & David, 1999). Virtually all (98%) of two-year public institutions provide remedial courses in the areas of reading, writing, and mathematics, and are more likely to offer a range of remedial courses than four-year institutions (Parsad & Lewis, 2003).

More than 40% of first-year community college students take at least one remedial course (Parsad & Lewis, 2003). However, there is remarkably little understanding of the impact of remediation on student outcomes. Most studies indicate that remedial courses have a positive impact on student retention and graduation (Bettinger & Long, 2005; Long & Amey, 1993; Perkhounkova et al., 2005; Waycaster, 2001). At the same time, there is negligible evidence that simply taking a remedial course is sufficient. Factors associated with student success include being assigned to and completing the highest level of remedial coursework (Long & Amey, 1993), earning a passing grade (Perin, 2006), earning a B or higher (Perkhounkova et al., 2005), and at the institutional level, the implementation of campus-wide programs that stress intensive, culturally diverse, and individualized attention (Waycaster, 2001).

As the population continues to age, the need for qualified nurses becomes even more critical. This mirrors current trends in ADN programs emerging as the number one hot program on community college campuses (McPhee, 2004). However, nursing students must compete for limited slots in selective admission programs, creating a unique challenge for open admission policies adopted by community college systems.

The role of remedial education in preparing students for admission to nursing programs is one of increasing student retention, completion of program requirements, and achieving passing scores on the NCLEX-RN examination. Many students entering community colleges test into remedial courses, which must be completed before admission into nursing programs (DiMaria, 2006; Germanna Community College, 2002; Gilroy, 2006b; Hoyt, 1999). Thus, examination of the relationship between remedial education and student success is imperative.

In nursing literature, most research on remediation focuses on students at risk for failing the NCLEX-RN (Nibert et al., 2006; Sayles et al., 2003; Sifford & McDaniel, 2007). In nursing

programs, as in higher education in general, GPA is a powerful predictor of success (Sayles et al., 2003; Schwarz, 2005; Stuenkel, 2005; Waterhouse & Beeman, 2003). In students placed in remedial courses, those with a higher GPA tend to be more successful (Grimes, 1997; Grimes & David, 1999). Furthermore, success in nursing programs can be contingent on grades in science, for which many community college students are inadequately prepared (Perin, 2006).

There is little question that the country faces a nursing shortage that will continue to escalate in severity in the future. The research suggests that remediation can help academically underprepared students earn a degree in nursing and pass the NCLEX-RN. However, it is probable that most nursing candidates in the community college setting will require intensive and individualized support.

## CHAPTER 3

### **Study Design and Methodology**

#### **Introduction**

The purpose of the study was to examine the predictive relationship between pre-entry variables and the number and type of remedial education courses taken on final cumulative grade point average and subsequent first-attempt passing of the NCLEX-RN licensure examination by graduates of Ivy Tech Community College's associate degree nursing (ADN) program graduates. Archival data was used to examine the impact of remedial education on nursing graduate success for the period 2004 through 2007. This chapter describes the study design and methodology used to answer the research questions stated in Chapter 1 and is organized as follows: study design, research questions, participants, variables examined, operational definition of variables, procedures, data analysis, and study limitations.

#### **Study Design**

The study employed a quantitative, descriptive, retrospective design, focusing on the impact of number and type of remedial education courses taken and demographic, pre-entry variables on student final cumulative grade point averages and first-attempt passing scores on the NCLEX-RN examination. The institution used for this study is Ivy Tech Community College in Indiana, a statewide community college system. A quantitative research design provided a method for establishing relationships and differences between the independent and dependent

variables. The retrospective analysis for this study was chosen to allow for exploring the relationship between inputs (demographic variables), environment (remedial education courses), and outputs (final cumulative GPA and passing scores on the NCLEX-RN examination). This study is based on research indicating predictor variables can have a significant impact on NCLEX-RN pass rates for associate degree nursing graduates (Alexander & Brophy, 1997; Arathuzik & Aber, 1998; Barkley et al., 1998; Byrd, Garza, & Nieswiadomy, 1999; Campbell & Dickson, 1996; Fowles, 1992; Hawsey, 1997; Heupel, 1994; Jenks, Selekman, Bross, & Paquet, 1989; Lamm & McDaniel, 2000; Lengacher & Keller, 1990; Ostrye, 2001; Rubino, 1998; Young-Richardson, 1996).

### **Research Questions**

The research questions in this study are designed to examine specific demographic, pre-entry variables, environmental impact in the form of remedial education, and Ivy Tech Community College associate degree nursing student outcomes. The research questions addressed by the study are as follows:

**Research question 1a.** What is the relationship between age, gender, and ethnic group and the number of remedial courses taken by associate degree nursing graduates from 2004 to 2007?

**Research question 1b.** What is the relationship between age, gender, and ethnic group and the type of remedial courses taken by associate degree nursing graduates from 2004 to 2007?

**Research question 2a.** To what extent do the number of remedial courses and type of remedial courses predict final cumulative grade point average (GPA) for associate degree nursing graduates from 2004 to 2007 when holding age, gender, and ethnic group constant?

**Research question 2b.** To what extent do the number of remedial courses and type of remedial courses predict pass/fail rates on the NCLEX-RN for associate degree nursing graduates from 2004 to 2007 when holding age, gender, and ethnic group constant?

**Research question 3a.** What is the relationship between age, gender, and ethnic group on final cumulative grade point average (GPA) for associate degree nursing graduates from 2004 to 2007?

**Research question 3b.** What is the relationship between age, gender, and ethnic group on pass/fail rates on the NCLEX-RN for associate degree nursing graduates from 2004 to 2007?

### **Participants**

The population used for this study consisted of students graduating from the ADN programs at Ivy Tech Community College period from 2004 through 2007. Graduates with first attempt NCLEX-RN examination scores from 2004-2007 were examined. Ivy Tech is a statewide, public community college system located in the Midwest with 23 campuses in 14 regions. It is the nation's largest statewide community college systems with a single accreditation and Indiana's largest public postsecondary institution serving more than 120,000 students a year (Ivy Tech Community College, 2008a). The student body is diverse and reflects the particular demographics of the each region of the state.

Each year, hundreds of students are admitted to the ADN programs statewide. Ivy Tech offers the ADN program in all 14 regions, with admissions occurring in both fall and spring semesters. Regions may have more than one campus and nursing programs may be offered at multiple sites within the same region. According to Ivy Tech Community College (2008b), "the Health Sciences Division continues to be one of the largest divisions in terms of production of graduates, and continues to grow. Its graduates increased 1.3% over 2005-06 and they now

represent 41.2% of all Ivy Tech graduates” (Ivy Tech Community College, 2008b, p. 1). Within the division of health sciences, ADN graduates for 2006-2007 make up 10.5% of the statewide total number of graduates

There were a total of 1,897 graduates for the period from 2004 through 2007 for the associate degree nursing programs in the Ivy Tech system (Ivy Tech Community College, 2007b). This is the college’s largest statewide program in the School of Health Sciences. Ivy Tech Community College is the primary educator of associate degree nursing graduates in Indiana. Of 32 ADN programs that were available to students in Indiana between 2004 and 2007, 14 of these are located on Ivy Tech campuses (Indiana Professional Licensing Agency, 2008).

Data for the study were retrieved from the institutional student information database recorded in spreadsheet form and from academic files maintained by the ADN program chairs. A data collection form was designed to obtain the NCLEX-RN pass rate results from the individual campuses (Appendix A) and e-mailed to each regional nursing program chair. Pass/fail licensure examination results were provided by regional program chairs as reported by the Indiana State Board of Nursing. Participant confidentiality was maintained by coding participant records with an assigned number using a unique identification number.

Permission to access student records was obtained from the Executive Director of Institutional Research at Ivy Tech Community College (Appendix B). Individual nursing program chairs were notified of the purpose of this research and nature of the study to enlist their support in obtaining pass/fall rate data for the study. Records from the 1,897 students comprised the original participant list. However, NCLEX-RN results of some graduates were unattainable from the individual schools if the graduate took their licensure examination outside of Indiana or

did not take their licensure examination within the study timeframe. Only those with reported NCLEX-RN scores were examined ( $N = 1,678$ ).

A statewide Ivy Tech nursing committee determines the curriculum, admission, and progression policies and procedures for consistent application across all Ivy Tech campuses. One variance noted across the state is that students may attend either part-time or full-time programs of study. Since the same curriculum, admission, and progression criteria are utilized statewide, no attempts were made to separate participant data between the part-time or full-time students. All students graduating from ADN programs with reported first attempt NCLEX-RN pass/fail scores were selected as participants for this study based on the uniqueness of the statewide college system and consistent statewide curriculum (Appendix C), admission, and progression policies across all campuses and regions.

### **Variables**

The selection of variables for this study was guided by Astin's (1993) I-E-O model. The framework for this model is supported by three primary constructs: (a) characteristics of students upon entry to the college system (inputs); (b) experiences during the college years (remedial education); and, (c) outcomes related to the inputs and college experiences (final cumulative GPA and first attempt NCLEX-RN pass/fail scores). Several studies have examined admission, demographic, and within program variables impacting student success in nursing programs and on nursing licensure examinations (Alexander & Brophy, 1997; Arathuzik & Aber, 1998; Barkley et al., 1998; Byrd et al., 1999; Campbell & Dickson, 1996; Fowles, 1992; Hawsey, 1997; Heupel, 1994; Jenks et al., 1989; Lamm & McDaniel, 2000; Lengacher & Keller, 1990; Ostrye, 2001; Rubino, 1998; Young-Richardson, 1996). Variables most often examined include age, gender, ethnicity, marital status, ACT/SAT scores, pre-admission testing, nursing course

GPA, cumulative GPA, remedial education needs, and financial aid status. However, many of these studies have focused on bachelor degree nursing students in four year universities making applicability of these results to associate degree nursing programs in community college systems questionable.

National studies provided a broad range of data obtained from a variety of stakeholders interested in the nursing shortage and nursing education issues (Center for Health Workforce Studies, 2005; Health Resources and Services Administration, 2002, 2004, 2005, 2006; Kimball & O'Neill, 2002; U.S. Census Bureau, 2001). However, an analysis of individual studies indicated prediction of success remains inexact and based on a wide variety of academic and non-academic variables. Conflicting findings exist regarding gender, motivation, age, marital status, ethnicity, student goals, grade point averages, and the need for remedial education. Sample size in some studies was limited, especially in areas of ethnic group and gender (Haas et al., 2004).

The variables employed for this study include multiple independent variables and two dependent variables. Demographic (input) variables included age, gender, and ethnicity. Environmental variables consisted of the number and type of remedial education courses taken by nursing program students. Dependent variables (outcomes) consisted of final cumulative grade point average and first time pass rates on the NCLEX-RN examination.

**Operational definition of independent variables.** Several independent variables were examined in this study including age, gender, ethnic group, and number and type of remedial education courses taken by ADN students.

*Age*: the number of years from birth to time of admission into the college system as self-reported on student admission records. This variable has been reported as 21 to 65 years of age and was rounded to the nearest whole year.

*Gender*: female or male, was reported as: female = 1 and male = 0.

*Ethnic group*: gathered from admission applications as self-reported by the student and reported as: European-American = 1, African-American = 2, Hispanic-American = 3, Native-American = 4, Asian or Pacific Islander-American = 5, other = 6, and not reported = 7.

*Remedial education courses*: student remedial education course needs were determined by required basic skills testing or equivalent SAT scores. The COMPASS or ASSET tests were the standard methods used to assess basic reading, writing, and mathematical skills. Established placement scores served as the basis for determining student remedial education needs. Students may be waived from this testing with appropriate transfer courses from other colleges, or with equivalent SAT or ACT scores.

Students may test into up to six individual remedial education courses. These include two reading courses (ENG 024 and ENG 025), two writing courses (ENG 031 and ENG 032), and two mathematics courses (MAT 044 and MAT 050). This information was retrieved from the college student information system database. Remedial education course needs were reported as follows: no remedial courses needed = 0; number of remedial courses needed reported as a number from 1 to 6. Remedial courses were categorized as: ENG 024 = 1, ENG 025 = 2, ENG 031 = 3, ENG 032 = 4, MAT 044 = 5, and MAT 050 = 6. Descriptions for each course can be found in Appendix D. Students must satisfactorily complete, be waived from, or test out of remedial education courses prior to admission into the ADN programs. If mastery is not achieved on the first attempt, students are provided multiple opportunities to successfully

complete these courses with a passing grade of C or higher. Letter grades of A, B, C, or F are given for each course.

**Operational definition of dependant variables.** Based on Astin's (1993) I-E-O model, two outcome variables, final cumulative GPA and first time NCLEX-RN pass/fail rates, were examined in this study.

*Final cumulative grade point average:* this dependent variable is a statistical mean calculated by the total summation of quality points. The grade point average for each course was calculated on a scale of 0.00 to 4.00. An A equals 4 points, a B equals 3 points, a C equals 2 points, a D equals 1 point and an F equals 0 points. The total number of quality points completed in the nursing program (which includes all required general education courses, but does not include remedial course grades) were totaled and divided by the number of semester hours the student completed at the end of the nursing program. Information on cumulative grade point averages was collected from Ivy Tech's student information system.

*First attempt pass rates on the national council licensure examination for registered nurses (NCLEX-RN):* the NCLEX-RN is a standardized test developed by the National Council for State Boards of Nursing and used "by the Boards of Nursing to test entry-level nursing competence of candidates for licensure as Registered Nurses" (Pearson Vue, 2007, p. 1). The test consists of multiple choice questions developed by nurse experts across the country from various nursing fields. Eligibility to take the exam is based on completion of the prescribed curriculum and graduation from a state accredited program of registered nursing. First-attempt NCLEX-RN pass/fail rates were provided by the individual schools of nursing throughout the Ivy Tech system.

Scores on the NCLEX-RN examination were reported as either pass or fail. The result of the first examination attempt was recorded for this study. Records of students whose licensure examination results were unknown were excluded from the study. The significance of first-attempt passing scores on the NCLEX-RN examination is based on accreditation standards set by state and national accrediting bodies. Pass rates were indicated by Pass = 1 and Fail = 0.

Table 1 illustrates the variables used in the study and the coding for each variable.

Table 1

*Coding of Independent and Dependent Variables*

Variable	Abbrev	Range
Final Cum. Grade Point Avg.	GPA	0.00-4.00
First attempt NCLEX-RN	NCLEX	P = 1, F = 0
Age	AGE	21-65
Gender	GEN	F = 1, M = 0
Ethnic Group	ETHN	1 = European-American 2 = African-American 3 = Hispanic-American 4 = Native-American 5 = Asian or Pacific Islander-American 6 = Other 7 = Not Reported
Remedial Education	REM	0 = No remedial needed 1 = ENG 024 2 = ENG 025 3 = ENG 031 4 = ENG 032 5 = MAT 044 6 = MAT 050

## **Data Analysis**

The college's Student Information System (SIS) database was used to obtain secondary information including demographic data, information on the number and type of remedial education courses attempted, final grade point averages, and program completion records. Information and statistics on regional, state, and national trends in remedial education, underprepared students, the community college system, and the nursing shortage were gathered from library and on-line resources. The regional location of schools of nursing was utilized for data on pass/fail rates on the NCLEX-RN for graduates from Ivy Tech as reported by the Indiana State Board of Nursing. Confidentiality of student information was maintained by coding each participant's record with a randomly assigned number. Permission to access student information was obtained from the college and the Office of Institutional Research (Appendix A).

A pre-analysis of data was conducted prior to the statistical analysis to identify variables outside the range of possible values. The importance of detecting extremes or outliers in the data is of particular concern as it may distort findings. The data set was assessed to ensure it met the assumptions of the statistical tests to be used in the analysis of the data. Descriptive data were used including: frequencies, mean, standard deviation, as well as skewness and kurtosis. Homoscedasticity, linearity, and multicollinearity were used to test the appropriateness of the data for analysis. An initial analysis was conducted using a correlation matrix to examine pairs of variables included in the study.

**Descriptive statistics.** Descriptive statistics were used to describe data for each of the variables used in this study. Frequencies for the nominal variables of first-attempt NCLEX-RN pass rates, gender, ethnicity, and number and type of remedial education courses are reported. The mean was calculated for age and final cumulative grade point average. The distribution of

each continuous independent variable was used to identify minimum, maximum, range, and standard deviation.

**Correlation.** Research questions 1a/1b and 3a/3b ask what relationship exists between different sets of variables. A Spearman Rho correlation coefficient was used to calculate the correlation coefficients. A Spearman Rho can be thought of as the nonparametric equivalent to the Pearson Product Moment Correlation coefficient but is used when variables do not meet the assumptions of the Pearson correlation coefficient. Several of the variables used in the correlations are not interval level of measurement, making Spearman the appropriate correlation. The Spearman Rho is computed from ranks and is interpreted as the proportion of variability accounted for in the pairs of variables. Like Pearson correlation coefficients, the Spearman Rho results in values from  $-1$  to  $0$  to  $+1$ .

**Multiple and logistic regression.** Research Question 2a asks whether there is a predictive relationship between number and type of remedial courses taken and final cumulative GPA. Multiple regression procedure was used to determine whether statistically significant predictive relationships could be identified between the independent (number of remedial courses and type of remedial courses) and dependent variables (final cumulative grade point average) holding personal characteristic variables constant. The purpose of multiple regression analysis was to identify the best combination of predictors of the dependent variable. With this method, sequential multiple regressions of independent variables are conducted one variable at a time and analyzed for their ability to account for the most variance in the dependent variable. When all variables have been entered, the regression model will be complete (Mertler & Vannatta, 2005). A probability level of  $p = .05$  or less has been used for this study.

Multiple regression methods are appropriate to use when the independent variables are nominal and binary. Due to the exploratory nature of this study, stepwise regression will be considered effective when associations of predictor variables with outcomes may not be evident (Menard, 1995). Multicollinearity is sometimes a problem in regression studies especially when there are two or more independent variables trying to capture the same variance.

Multicollinearity was assessed by inspecting the variance inflation factor (VIF). If the VIF is less than 10.0, multicollinearity is not typically thought of as a problem (Stevens, 1992).

Since the dependent variable for Research Question 2b is a dichotomous outcome, pass/fail, multiple regression is not appropriate as it requires an interval level of measurement or continuous variable. Logistic regression was used to address Research Question 2b. Logistic regression is similar to multiple regression and is used where the dependent or predicted variable is categorical or dichotomous. The procedure seeks to identify the variables predicting membership into one of two groups (pass/fail) as in the present study. In logistic regression, several independent variables are regressed onto a categorical or dichotomous dependent variable. Logistic regression does not require meeting assumptions about distributions of the predictor variables. There is, however, a question of the number of variables included in the analysis. This was not a problem as the sample studied included 1,678 participants. Like multiple regression, logistic analysis will be subject to multicollinearity problems. If multicollinearity is present, it may be necessary to remove redundant variables from the analysis.

### **Study Limitations**

Ivy Tech Community College consists of 14 regions across Indiana. All students commute to campus. Pre-entry and program admission criteria were consistent statewide. The same associate degree nursing curriculum is utilized in all regions across the state to enhance

transferability and program completion. Course outcome measures and competencies were consistent statewide. Limitations of this study relate to participants, design method, data collection, and variables studied. Some of these limitations will decrease generalizability and may be potential threats to internal validity.

**Participants.** The use of a population from a single Midwestern state will limit generalizability as it may not be representative of the entire national population. However, since the population was taken from various regions across Indiana, this may increase generalizability to community college associate degree nursing programs in this region of the country. Students in this study come from varying demographic regions across the state where there may have been inherent differences in intensity of instruction or outside assistance provided to enhance program completion and success on the NCLEX-RN examination. However, controlling for demographic factors should increase generalizability.

**Design and analysis method.** Descriptive and retrospective study designs do not allow for the manipulation of variables resulting in lack of generalizability. The major limitation of all regression techniques is that relationships, not necessarily causal mechanisms, can be identified. For this study, the researcher was dependent on the accuracy of information obtained from student data records including admission data self reported by the students.

**Secondary data.** Use of evidence from secondary sources may pose potential threats to accuracy and reliability of data. Pertinent secondary information such as student biographical data may be incomplete or unavailable. Self-reporting errors, transcription errors, interpretation of data, and the method of original data collection may be potential limitations for this study.

**Student variables and characteristics.** A variety of student characteristics were not controlled for in this study. Variables not considered included: the types and amount of family

support; individual learning styles; work status; academic and social integration; amount of time dedicated to studying; the impact of personal life events; use of outside resources to enhance learning; educational goals and aspirations; and satisfaction with faculty, program variables, and resources. An understanding of the impact of these variables should be considered in future research to gain insight into their impact on student progress, retention, grade point average, program completion, and success on the NCLEX-RN examination.

**Remedial education.** Students requiring the maximum number of remedial education courses available, six in total, may be weak academically. It is feasible that students required to take remedial coursework may not have received the academic advantages in high school and middle school experienced by those not needing remedial coursework. In this instance, the effect of remedial education may be a moot point. Since this study does not examine the quality of academic preparation before admission, those with fewer advantages and poor education prior to college were at an obvious disadvantage. Secondly, remedial education may, in fact, be cumulative in its effects.

## **Summary**

Chapter 3 presented the methodology used in addressing the research questions posed by the study. The questions were presented and the source and description of the study's potential participants was discussed. The variables used in the study were defined and the sources of the data were presented. The procedures used in the analysis of the data were articulated along with the limitations to the study. Chapter 4 presents the findings of the analysis of the data used in the study. A description of the participants is presented as well as the analysis of the data for each research question.

## CHAPTER 4

### **Analyses and Results**

The purpose of this quantitative, retrospective, prediction study was to gain an understanding of factors influencing nursing student outcomes. The study examined the impact of remedial education on ADN student success as measured by final cumulative GPA and students subsequent pass or fail rates on the NCLEX-RN examination. Personal characteristic (input) variables of age, gender, and ethnic group were examined to determine whether they were predictors of success for ADN graduates of Ivy Tech Community College in Indiana for the period 2004 through 2007.

The purpose of the study was threefold: (a) to identify select student demographic variables upon admission to the college system and their impact on nursing graduate outcomes, (b) to analyze the predictive relationship between the number and type of remedial courses on nursing graduate outcomes while holding other variables constant; and, (c) to examine the relationship between select student demographic variables on nursing graduate outcomes. Utilizing Astin's (1993) Input-Environment-Outcomes (I-E-O) model, the study focused on input variables (student characteristics at time of entry into the college system) and environment (number and type of remedial courses taken) on performance outcomes (final cumulative grade point average and first-attempt pass/fail scores on the NCLEX-RN examination) of ADN graduates between 2004 and 2007 in a state-wide community college system.

The chapter is presented in three sections: (a) examination of the data beginning with findings from the descriptive analysis of dependent and independent variables; (b) presentation of findings related to each of the six research questions; and, (c) chapter summary.

### **Descriptive Analysis**

The initial population for this study included 1,897 graduates from Ivy Tech Community College ADN programs from 2004 through 2007. A total of 219 students with no reported NCLEX data were deleted from the dataset, leaving a final sample size of 1,678. Frequency distributions were calculated for the nominal variables of first-attempt NCLEX-RN pass rates as well as for gender, ethnicity, and number and type of remedial education courses. The mean was calculated for age and final cumulative GPA. The distribution of each continuous independent variable was used to identify minimum, maximum, range, and standard deviation.

Correlations were used to answer research questions 1a, 1b, 3a, and 3b exploring the relationships between different sets of variables. A Spearman Rho was used to calculate the correlation coefficients. Multiple and logistic regressions were used to answer research questions 2a and 2b asking whether there was a predictive relationship between the number and type of remedial courses taken and final cumulative GPA.

### **Demographic Characteristics**

At the time of admission, students in the study sample were reported to be between 21 and 65 years of age ( $M = 35.15$ ,  $SD = 8.021$ ). The median age was 34.5 and the mode was 28. Fall 2007 data indicated the average age of all students admitted statewide to the Ivy Tech system was 27.8 with a median age of 24 (Ivy Tech Community College, 2007b).

Of the total sample examined, 1,523 were women (90.8%) and 155 were men (9.2%). Figure 2 provides the distribution of percentages for gender. This finding is consistent with

nursing being a predominately female-oriented occupation (Kimball & O'Neill, 2002).

According to Ivy Tech Community College (2007b), female students continue to outnumber male students although the numbers of both are increasing statewide.

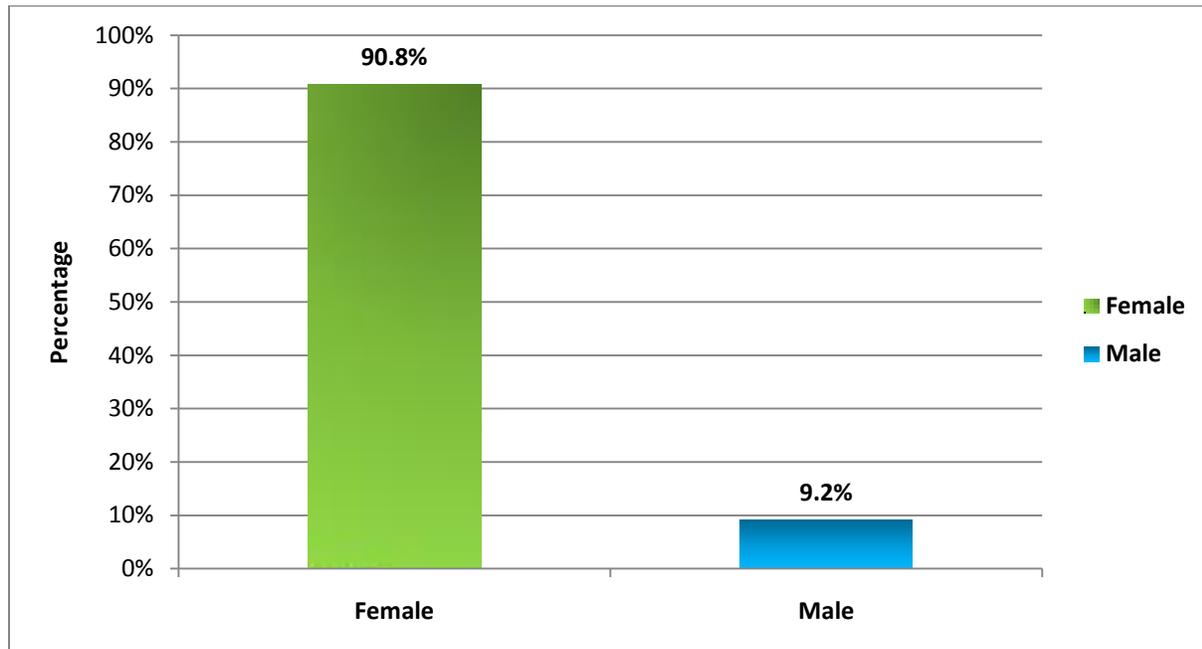


Figure 2. Percentage distribution for gender

The sample consisted of European-Americans ( $n = 1,556, 92.7\%$ ), African-Americans ( $n = 57, 3.4\%$ ), Hispanic-Americans ( $n = 25, 1.5\%$ ), Native-Americans ( $n = 8, .5\%$ ), Asian or Pacific Islander-Americans ( $n = 11, .7\%$ ), other ( $n = 12, .7\%$ ), and not reported ( $n = 9, .5\%$ ). As reported by Ivy Tech (2007b), “the number of Hispanic students increased by 20.3 % and the number of Multi-Racial students enrolled increased by 18.1%” (Ivy Tech Community College, 2007b, p. 1). Total minority enrollment was relatively unchanged from the previous year. The fall 2007 end of term count reported the total minority population of Ivy Tech was 17.5% which included students in all programs across the college. Compared to ethnic group data reported for nursing program graduates between 2004 and 2007, the college data demonstrates a larger

minority population for all programs (17.5%) as compared to that of ADN nursing program students (6.1%). Table 2 provides information on distribution for the variable ethnic group for the sample population.

Table 2

*Frequencies and Percents for Ethnic Group*

Variable	Frequency	Percent
European-Americans	1,556	92.7%
African-Americans	57	3.4%
Hispanic-Americans	25	1.5%
Native-Americans	8	.5%
Asian or Pacific Islander- Americans	11	.7%
Other	12	.7%
Not Reported	9	.5%

Data were also available for the number of terms students in ADN programs were enrolled during their tenure with the college. While not specific to the questions posed by the study, it was interesting to note the number of terms students were enrolled before graduating ranged from a minimum of 3 terms to a maximum of 19 with an average of 9.81 terms ( $SD = 2.876$ ). This finding may represent increased time to degree completion for students required to take remedial education courses, or may reflect students who were enrolled on a part-time basis. Another option may be that these data represent, at least in part, nursing students who fail out of a course and required to wait until the course became available for them to retake

and complete the program. This process could take up three semesters if the course is only offered on an annual basis.

Cumulative GPAs for the ADN students ranged from a minimum of 2.099 to a maximum of 4.000, with a mean of 3.30 ( $SD = .343$ ). A total of 1,678 students had reported NCLEX examination results with 204 failing (12.2%) and 1,474 passing (87.8%). Students attended classes fulltime ( $n = 1,198$ , 71.4%) or part-time ( $n = 480$ , 28.6%). Figure 3 provides a histogram of results for NCLEX-RN pass/fail outcomes. Figure 4 displays the distribution for full-time and part-time enrollment status for the sample population.

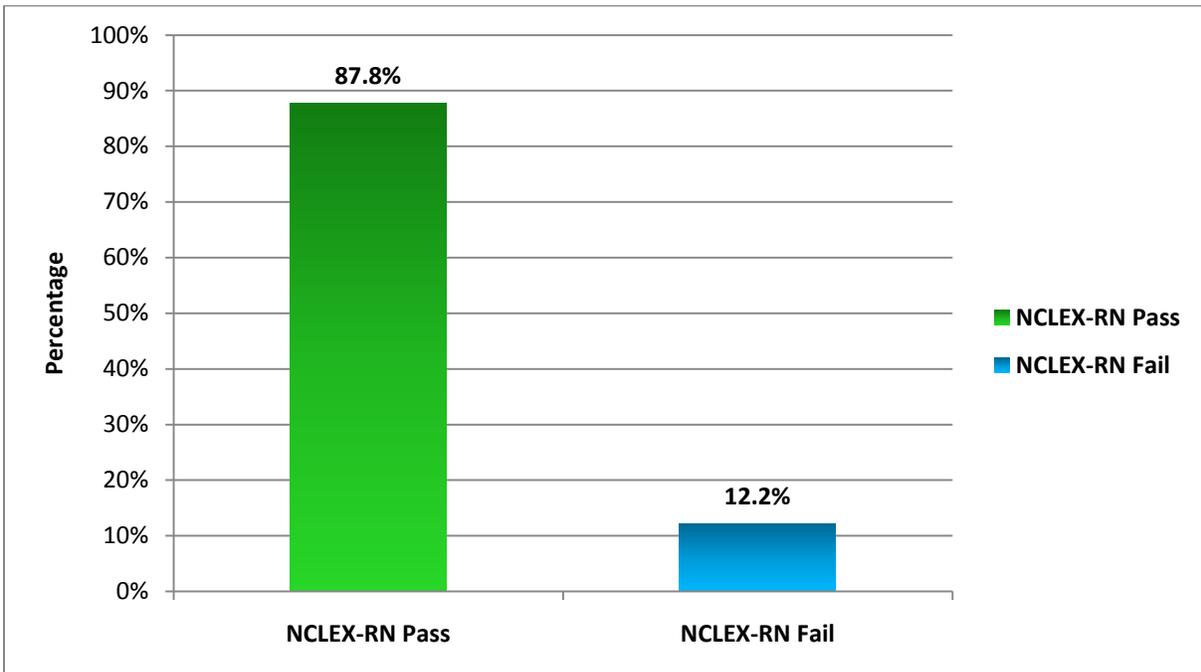
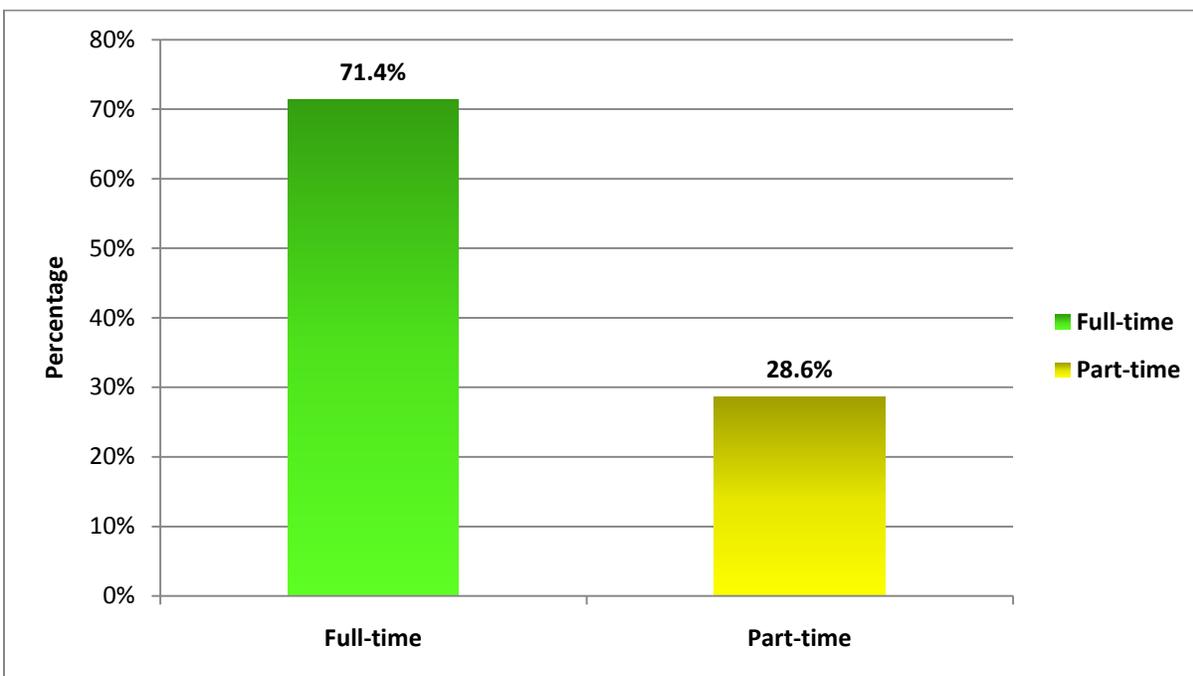


Figure 3. NCLEX-RN examination pass/fail results



*Figure 4.* Percentage distribution for full-time and part-time enrollment status

Table 3 provides data on the number of times each of the six remedial courses were taken with corresponding frequencies and percents. Just over half of the ADN students did not have to take a remedial course to complete their educations ( $n = 859$ , 51.3%). However, 817 students (48.7%) were required to complete one or more remedial courses before being admitted to the nursing program. A total of 1,189 remedial courses were taken (at least one or more per student) by the 817 students in the sample population. Figure 5 shows the percentage of remedial courses taken by type of course for the sample.

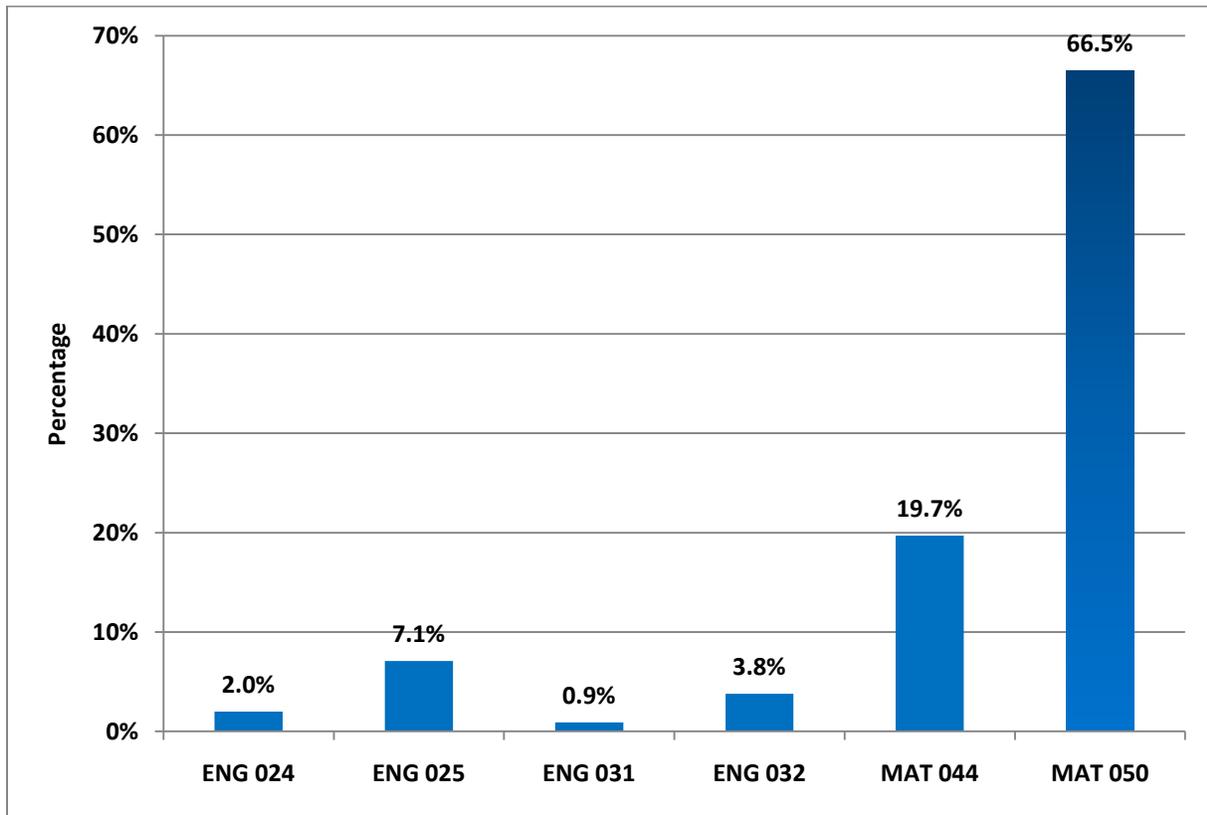


Figure 5. Percentage of remedial courses taken by type of course

Table 3

*Distribution of Frequencies and Percents for Remedial Education Courses*

Course	Times Taken	Frequency	Percent
ENG 024	1	19	79.2%
	2	4	16.7%
	3	1	4.2%
ENG 025	1	81	96.4%
	2	3	3.6%
ENG 031	1	11	100%
ENG 032	1	44	97.8%
	2	1	2.2%
MAT 044	1	229	97.9%
	2	5	2.1%
MAT 050	1	743	93.9%
	2	41	5.2%
	3	6	.8%
	4	1	.1%

**Findings**

**Research question 1a.** Research question 1a was: What is the relationship between age, gender, and ethnic group and the number of remedial courses taken by associate degree nursing graduates from 2004 to 2007? A Spearman's Rho correlation coefficient was used to test whether age, gender, number of remedial courses taken and ethnic group were significantly related. The

Spearman Rho correlation coefficient was selected for the analysis as the type of variables examined were not all interval level measurements as required for the Pearson Product Moment correlation statistic. The Spearman Rho correlation identifies the magnitude (strength of correlation) and direction of a relationship. A correlation coefficient can range from -1 to 0 to +1 and the closer to 1 the stronger the relationship (Mertler & Vannatta, 2005). As can be seen in Table 4, there were some statistically significant correlations; however, few of the correlation coefficients were very strong. Age and gender were negatively correlated ( $r_s = -.106, p = <.001$ ) and age was significantly correlated with number of remedial courses ( $r_s = .146, p = <.001$ ).

Results demonstrated that age was positively related to number of remedial courses indicating that age may be used to predict number of remedial courses taken for ADN students. The positive relationship for this finding suggest that as a student's age increases the number of remedial courses taken also increases. The negative relationship between variables such as age and gender implies that a high value for one variable (i.e. age) is associated with a low value (i.e. gender) in the other. The findings suggest that as age increases or decreases, the likelihood of being a female student increases or decreases. For this study, gender was coded as female = 1 and male = 0. Therefore, a lower age value may be predictive of a higher value for gender (more likely to be a female student).

Table 4

*Spearman Rho Correlation Coefficients for Number of Remedial Courses*

		Ethnicity	No. Classes	Gender	Age
Ethnicity	$r_s$	1.00			
No. Courses	$r_s$	.006	1.00		
	$p$	.797			
Gender	$r_s$	.032	.035	1.00	
	$p$	.184	.158		
Age	$r_s$	.011	.146*	-.106*	1.00
	$p$	.644	<.001	<.001	

\* Significant at  $p = .05$  or less, two tailed

**Research question 1b.** The second research question was stated as follows: What is the relationship between age, gender, and ethnic group and the type of remedial courses taken by associate degree nursing graduates from 2004 to 2007? A Spearman Rho correlation coefficient was used to answer the question of whether type of remedial education course (ENG 024, ENG 025, ENG 031, ENG 032, MAT 044, or MAT 050) was related to demographic variables. There were a number of statistically significant correlations; however, the correlations were weak to very weak with correlation coefficients between  $r_s = .159$  and  $r_s = .049$ . Statistically significant correlations were found between age and gender ( $r_s = -.106$ ,  $p = <.001$ ), ENG 032 and gender ( $r_s = -.049$ ,  $p = .045$ ), MAT 044 and age ( $r_s = .079$ ,  $p = .001$ ) and, MAT 050 and gender ( $r_s = .054$ ,  $p = .026$ ) and MAT 050 and age ( $r_s = .159$ ,  $p = <.001$ ).

Results provided statistically significant correlations; however, they were very weak correlations. Again, age and gender were negatively correlated (as one variable increases, the

other decreases in size). The findings suggest that gender may be a predictor for remedial coursework in ENG 032 and MAT 050 for ADN students. The statistically significant findings for gender and type of remedial course suggests that women may be less likely to need remediation in reading (ENG 032) and more likely to need basic algebra (MAT 050). Age was found to have a predictive relationship with MAT 044 and MAT 050 suggesting increasing student age may be a predictor for remedial coursework in both mathematics courses. Table 5 lists results of the Spearman Rho correlations between demographic variables and type of remedial course taken.

Table 5

*Spearman Rho Correlation Coefficients with Type of Remedial Course*

		Ethnicity	Gender	Age
Ethnicity	$r_s$	1.0		
Gender	$r_s$	.032	1.0	
	$p$	.184		
Age	$r_s$	.011	-.106*	1.0
	$p$	.644	<.001	
ENG 024	$r_s$	.005	.004	.016
	$p$	.852	.874	.524
ENG 025	$r_s$	.010	-.012	.012
	$p$	.693	.637	.627
ENG 031	$r_s$	.032	-.005	-.005
	$p$	.191	.844	.844
ENG 032	$r_s$	-.004	-.049*	-.013
	$p$	.878	.045	.609
MAT 044	$r_s$	-.039	.017	.079*
	$p$	.110	.499	.001
MAT 050	$r_s$	-.007	.054*	.159*
	$p$	.778	.026	<.001

\* Significant at  $p = .05$  or less, two tailed

**Research question 2a.** Research question 2a asked whether there were predictors of students' grade point average and was as follows: To what extent do the number of remedial

courses and type of remedial courses predict final cumulative grade point average (GPA) for associate degree nursing graduates from 2004 to 2007 when holding age, gender, and ethnic group constant? Stepwise multiple regressions were used to identify the best combination of predictors of the dependent variable. Final cumulative GPA was the dependent variable and number of remedial courses, and type of courses (ENG 024, ENG 025, ENG 031, ENG 032, MAT 044, and MAT 050) were the independent or predictor variables. The stepwise regression procedure tests each variable as if it were the last to enter the model. A variable might have been a good predictor in conjunction with other variables at one time but no longer is a good predictor (Mertler & Vannatta, 2005). All variables were tested to ensure the best model was found.

The analysis identified a one step model with MAT 050 as the only variable to significantly enter the model ( $R^2 = .004$ ,  $R^2_{adj} = .004$ ,  $F[1, 1674] = 6.903$ ,  $p = .009$ ). Although this was statistically significant, the model only accounted for .4% of the variance in students' GPA indicating there are other factors influencing students' GPA besides the MAT 050 class. The model coefficients are presented in Table 6. While various demographic variables such as age and gender were only loosely correlated with each other, when correlated against non-demographic variables, such as remedial education course requirements, results identified statistically significant correlations albeit weak ones for GPA. Specifically, those participants requiring a remedial course of MAT 050 demonstrated a weak statistical predictive relationship with final cumulative GPA.

Table 6

*Model Coefficients for GPA*

	<i>B</i>	$\beta$	<i>T</i>	<i>P</i>	<i>Bivariate r</i>	<i>Partial r</i>
MAT 050	.039	.064	-2.627	.009	-.064	-.064

**Research question 2b.** Research question 2b asked whether there were predictors of students' passing or failing the NCLEX exam and was as follows: To what extent do the number of remedial courses and type of remedial courses predict pass/fail rates on the NCLEX-RN examination for associate degree nursing graduates from 2004 to 2007 when holding age, gender, and ethnic group constant? The dependent variable was dichotomous therefore a logistic regression was used to answer this question. The predictor or independent variables were type of remedial course (ENG 024, ENG 025, ENG 031, ENG 032, MAT 044, and MAT 050) and number of remedial courses taken. A probability level of  $p = .05$  was used as the criteria for interpreting the data. Results of the logistic analysis indicated none of the variables (number and type of remedial course taken) proved to be a statistically significant predictor of pass or fail on the NCLEX-RN examination.

**Research question 3a.** Research question 3a examined the relationship between descriptive variables and final cumulative GPA and was as follows: What is the relationship between age, gender, and ethnic group on final cumulative grade point average (GPA) for associate degree nursing graduates from 2004 to 2007? A Spearman Rho correlation coefficient was used to answer the question. A Spearman Rho can range between  $-1$  to  $0$  to  $+1$  and the closer the correlation coefficients are to  $0$  the weaker the correlation or relationship. There were

statistically significant correlations; however, they were not strong correlations. Age was negatively correlated with gender ( $r_s = -.106, p = <.001$ ), GPA was correlated with ethnicity ( $r_s = -.099, p = <.001$ ), and GPA was correlated with age ( $r_s = .228, p = <.001$ ). As with other results, these were statistically significant yet weak correlations between demographic variables and cumulative GPA for ADN graduates. Negative correlations were evident between ethnicity and GPA indicating that ethnicity may be a predictor of final cumulative GPA. Age produced a statistically significant, positive correlation with GPA. This finding implies that age may be a predictor for GPA or as a student's age (in years) increases, final cumulative GPA will increase. Table 7 presents the correlation matrix for GPA and descriptive variables.

Table 7

*Spearman Rho Correlation Coefficients for GPA*

		Ethnicity	Gender	Age	GPA
Ethnicity	$r_s$	1.00			
Gender	$r_s$	.032	1.0		
	$p$	.184			
Age	$r_s$	.011	-.106*	1.0	
	$p$	.644	<.001		
GPA	$r_s$	-.099*	-.012	.228*	1.0
	$p$	<.001	.624	<.001	

\* Significant at  $p = .05$  or less, two tailed

**Research question 3b.** Research question 3b was as follows: What is the relationship between age, gender, and ethnic group on pass/fail rates on the NCLEX-RN for associate degree nursing graduates from 2004 to 2007? The question asked whether there was a relationship

between descriptive variables and pass/fail results on the NCLEX-RN examination. There was a statistically significant negative relationship between age and gender ( $r_s = -.106, p = <.001$ ) as has been seen previously. There was also a statistically significant negative relationship between NCLEX-RN performance and ethnic group ( $r_s = -.078, p = .001$ ), and significant positive relationship between NCLEX-RN performance and age ( $r_s = .068, p = .005$ ).

Results demonstrated statistically significant yet weak correlations between demographic variables (age and ethnic group) and performance on the NCLEX-RN examination. The correlations between age and ethnic group to NCLEX performance indicate that these demographic variables may be predictors of NCLEX-RN outcomes. The positive relationship between age and NCLEX-RN performance indicates that an increase in age may be predictive of greater success on pass rates for the NCLEX-RN examination. Table 8 presents the correlation coefficients for the descriptive variables with pass/fail outcomes on the NCLEX-RN examination.

Table 8

*Spearman Rho Correlation Coefficients for NCLEX-RN Examination*

		Ethnicity	Gender	Age	NCLEX
Ethnicity	$r_s$	1.00			
Gender	$r_s$	.032	1.0		
	$P$	.184			
Age	$r_s$	.011	-.106*	1.0	
	$P$	.644	<.001		
NCLEX	$r_s$	-.078*	.005	.068*	1.0
	$P$	.001	.826	.005	

\* Significant at  $p = .05$  or less, two tailed

**Summary**

Chapter 4 provided descriptive and inferential statistics used to describe and analyze data from 1,678 nursing graduates from Ivy Tech Community College for a period between 2004 and 2007. A demographic profile including variables of age, gender, and ethnic group was established for the sample participants. Results of the correlation and regression analyses examining the impact of remedial education on nursing student outcomes were presented. In addition, the logistic regression model's ability to predict NCLEX-RN examination performance was assessed.

Following a robust analysis of the data, several statistically significant, but weak relationships were found. Age was significantly related to: number of remedial courses taken ( $r_s = .146$ ); gender ( $r_s = -.106$ ,  $p = <.001$ ); MAT 044 ( $r_s = .079$ ,  $p = .001$ ); MAT 050 ( $r_s = .159$ ,  $p = <.001$ ). Gender was significantly correlated with: ENG 032 ( $r_s = -.049$ ,  $p = .045$ ); and

MAT 050 ( $r_s = .054$ ,  $p = .026$ ).

Multiple regressions were conducted to examine the extent that number and type of remedial education courses were predictors of final cumulative GPA. The analysis found there was a one step model with MAT 050 as the only variable to significantly enter the model ( $R^2 = .004$ ,  $R^2_{adj} = .004$ ,  $F[1, 1674] = 6.903$ ,  $p = .009$ ). Although this was statistically significant, the model only accounted for .4% of the variance in students' GPA indicating there are other factors influencing students' GPA besides the MAT 050 course. Number and type of remedial education courses were not found to be predictors of NCLEX-RN examination performance. Significant correlation coefficients were found between age and ethnicity and outcome variables of final cumulative GPA ( $r_s = .228$  and  $r = -.099$ ) and NCLEX-RN pass/fail rates ( $r_s = .068$  and  $r = -.078$ ).

Findings suggest that demographic variables of age and gender may be predictors of number and type of remedial courses. Specifically, age may be a predictor of the number of remedial courses taken and type of remedial courses taken by ADN students (MAT 044 and MAT 050). Gender was found to be a weak predictor for the type of remedial education course taken (ENG 032 and MAT 050). Results suggest that female students may be less likely to need remediation in ENG 032 and more likely to need MAT 050.

Number and type of remedial courses showed no statistically significant, predictive relationships with pass/fail rates on the NCLEX-RN examination. Ethnicity and age were found to be weak predictors of final cumulative GPA and pass/fail performance on the NCLEX-RN examination. Chapter 5 presents a summary of the research findings, issues and barriers, and conclusions and recommendations for further study.

## CHAPTER 5

### **Conclusions and Recommendations**

Findings from this study indicate that remedial education at Ivy Tech Community College is effective. The sample populations' first-attempt pass rates (87.8%) on the NCLEX-RN examination were higher than the national average (84.8%). Grade point averages were relatively high with a mean of 3.30 based on a 4-point scale. None of the remedial courses studied demonstrated any impact on NCLEX-RN outcomes for the sample population. The only remedial course found to have a statistically significant impact on final cumulative GPA was MAT 050, Basic Algebra. However, the model only accounted for .4% of the variance indicating other factors besides MAT 050 were impacting GPA.

Findings suggest that demographic variables of age and gender may be predictors of number and type of remedial courses taken. Specifically, age may be a predictor of the number of remedial courses taken and type of remedial courses taken by ADN students (MAT 044 and MAT 050). Gender was found to be a weak predictor for the type of remedial education course taken (ENG 032 and MAT 050). Results suggest that female students may be less likely to need remediation in ENG 032 and more likely to need MAT 050.

Community colleges serve a high volume of minority, low-income, and first-generation students who enter college with inadequate preparation (Grimes & David, 1999). Pre-admission screening in reading, writing, and mathematics can result in student placement in one or more

remedial education courses which must be successfully completed before students are eligible for admission into many nursing programs. Greater understanding of the impact of remedial education on nursing student outcomes can provide a variety of benefits for students, faculty, and administrators. Chapter 5 summarizes the purpose of the study and presents a discussion of key findings, issues and barriers, and, conclusions and recommendations for future research.

### **Purpose of the Study**

The purpose of this study was to gain an understanding of factors influencing nursing student outcomes by examining the impact of remedial education on ADN student success as measured by final cumulative GPA and subsequent pass or fail rates on the NCLEX-RN examination. Astin's (1993) I-E-O model was applied to the context of community college students enrolled in an ADN program in order to formulate a model for predicting success on the NCLEX-RN. Astin's model has been utilized in several studies exploring the impact of remedial education on the persistence of academically underprepared community college students (Campbell & Blakey, 1996; Long & Amey, 1993; Zhao, 1999). The model is based on the premise that characteristics of the individual student interact with features of the environment to which the student is exposed during college to predict outcomes of the college experience. Age, gender, and ethnic group were selected as the input variables, with the number and type of remedial courses taken the environmental variables, and the students' final cumulative GPA and first-time pass rates on the state NCLEX-RN serving as the outcome variables. Although nurse educators are engaged in ongoing research to identify students at risk for failing the licensure examination with the aim of targeting interventions, no previous studies were identified that used Astin's model as a framework for examining NCLEX-RN success in a community college system.

## **Key Findings**

**Demographic variables.** The standardized, statewide nursing curriculum, admission requirements, and remedial education guidelines of Ivy Tech Community College ADN programs allowed for examination of student outcomes using a large sample population. The study sample included 1,678 graduates for whom NCLEX-RN pass/fail data was available. The sample population ages ranged from 21 to 65 years of age, with a mean of 35.15, median of 34.5 and a mode of 28. Comparatively, the average age of all students admitted to the Ivy Tech Community College system in fall 2007 was 27.8 with a median age of 24 (Ivy Tech Community College, 2007b). The older age of the ADN students is consistent with the national trend in enrollments in nursing education (Goodin, 2003).

Reflecting the overall composition of the nursing profession, an overwhelming number of participants in the study were women (90.8%). Ethnically, European-Americans represented 92.7% of the study sample. This is inconsistent with findings indicating that the majority of students in community colleges tend to be of nontraditional age and female (National Center for Educational Statistics, 2006). Of the remaining sample population, 3.4% were African-American, 1.5% Hispanic-American, .5% were Native-American, and .7% were Asian or Pacific Islander-American. A total of 1.2% reported “other” or did not report their ethnicity. The 6.1% ADN graduates of reported minority heritage is considerably lower than the 17.5% of minority students who graduated from all Ivy Tech Community College programs between 2004 and 2007 (Ivy Tech Community College, 2007b).

**Remedial education requirements.** It was anticipated at the start of this research, based on previous research regarding community colleges and inadequate preparation for college level course work, many students would need to take remedial education courses prior to admission to

the ADN nursing programs at Ivy Tech Community College. However, findings from this study showed that slightly less than half the ADN graduates (48.7%) were required to take a remedial course to complete their education, compared to 59% for Ivy Tech Community College students overall (Ivy Tech Community College, 2007a). Additionally, the vast majority of the sample population enrolled in remedial courses successfully completed these courses by obtaining a C or higher the first time they took the course as follows: ENG 024 (79.2%), ENG 025 (96.4%), ENG 031 (100%), ENG 032 (97.8%), MAT 044 (97.9%), and MAT 050 (93.9%). The academic profiles of the Ivy Tech Community College ADN graduates and the persistence to graduation and high NCLEX-RN pass rates even among the students assigned to remedial courses suggest that the RN candidates were a motivated and determined group.

### **Research Results**

This study was driven by three major research questions, each one subdivided into two parts, allowing for a series of analyses leading up to the test of the full model. Questions were based on Astin's (1993) model of inputs, environment, and outcomes.

**Research question 1a.** What is the relationship between age, gender, and ethnic group and the *number* of remedial courses taken by associate degree nursing graduates from 2004 to 2007? The most significant finding was that age was related to the number of remedial courses taken by ADN students in a community college system. The positive correlation between age and number of remedial courses comes at no surprise considering those in the sample population had a mean of 35.15 years of age. The older age of the sample population is consistent with research which states "compared with students attending 4-year colleges, community college students are more likely to be older" (National Center for Educational Statistics, 2006, p. 9).

Nontraditional age students are often faced with a variety of additional challenges and responsibilities including responsibilities including work, children, and financial issues (National Center for Educational Statistics, 2006) which may impact age at time of admission to the college. Limited use of and/or lack of refinement in reading, writing, and math skills beyond high school and the amount of time since high school graduation may impact the need for remediation in the older, nontraditional student population.

**Research question 1b.** What is the relationship between age, gender, and ethnic group and the *type* of remedial courses taken by associate degree nursing graduates from 2004 to 2007? Results of this study found that age was related to both remedial mathematics courses, indicating that older adult students may need remediation in MAT 044 and MAT 050. Although age was found to be a factor in both the number and type of remedial courses needed, student success on the NCLEX-RN examination was not significantly impacted as evidenced by high pass rates for the sample population. The higher than average age of the sample population as compared to the college overall (35.15% versus 27.8%) demonstrates that nontraditional adults students who complete remedial education courses do as well or better than those who do not take remedial courses in relation to NCLEX-RN examination success.

Gender was found to have a statistically significant negative relationship with ENG 032/Reading Strategies for College II and a significant positive relationship with MAT 050/Basic Algebra. These findings indicate that women may be less likely to need remediation in ENG 032 and more likely to need remediation in MAT 050. In a study on gender differences and mathematics, James (2007) found girls had better verbal skills but performed more poorly on mathematics tests than boys, although these differences were minimal by the time students entered the college system. James found that gender gaps in verbal and mathematic skills are

narrowing, noting “all students are doing better in math. Girls have made progress in math proficiency over almost 20 years; however, reading skills for boys are slipping” (James, 2007, Discussion section, para 1). James noted that women often have difficulty separating math from words indicating that “the most common complaint that women have with mathematics is word problems” (James, 2007). This may explain why women in the current study were found to have a higher probability of testing into remedial courses mathematics and basic algebra. Greater opportunities for women in science-related fields, improvements in teaching based learning styles, and motivational factors are all variables which may have impacted findings in the current study. Non-traditional students are challenged with application and development of extensive reading, writing, and algebraic skills needed to progress through nursing education programs. Further research on the impact of age and gender on number and type of remedial courses needed by nursing students would provide even greater insight on this issue.

**Research question 2a.** To what extent do the number of remedial courses and type of remedial courses predict final cumulative GPA for associate degree nursing graduates from 2004 to 2007 when holding age, gender, and ethnic group constant? In this analysis, only MAT 050 had the statistical power to be included in the model as a predictor of GPA. At the same time, the MAT 050 remedial math course explained only .4% of the variance in the students’ GPA, confirming previous research findings that found that there are other factors besides remedial courses affecting the academic success of students who enter college academically underprepared (Hoyt, 1999). A possible explanation for the weak relationship observed between remedial coursework and GPA might be that the overwhelming majority of students passed their remedial courses the first time thus the non-credit courses did not pose a serious disruption to the pursuit of credit courses and entry into the nursing program.

**Research question 2b.** To what extent do the number of remedial courses and type of remedial courses predict pass/fail rates on the NCLEX-RN examination for associate degree nursing graduates from 2004 to 2007 when holding age, gender, and ethnic group constant? In terms of NCLEX-RN performance, none of the factors related to remedial education predicted NCLEX-RN success after controlling for age, gender, and ethnicity. This finding demonstrates that remedial education at Ivy Tech Community College is effective for ADN students. None of the remedial courses examined in the study were found to impact NCLEX-RN success despite that fact that 48.7% of the study sample population took at least one remedial education course.

In addition, the emergence of MAT 050 as the only remedial course to have the statistical power to be included in the model is not surprising given that 66.5% of the remedial courses taken were in Basic Algebra, MAT 050. It is noteworthy that the remedial course with the second highest proportion of remedial courses taken was in Mathematics, MAT 044 (19.7%). MAT 050 was also the only remedial course in which a substantial number of students took the course more than once (41 students took the course twice, 6 students took the course three times, and 1 student took the course four times).

Remedial education programs are designed to provide opportunities for students who do not qualify for college-level courses to improve their skills in reading, writing, and mathematics and proceed to high-level courses in their curriculum. While research provided mixed findings regarding the positive and negative impact of remedial education on student outcomes, results of this study demonstrated that only MAT 050/Basic Algebra had a weak but significant impact on final cumulative GPA. The number and type of remedial courses taken did not appear to impact NCLEX-RN success.

**Research question 3a.** What is the relationship between age, gender, and ethnic group on final cumulative grade point average (GPA) for associate degree nursing graduates from 2004 to 2007? Both ethnicity and age produced significant albeit weak correlations with GPA. A negative relationship was evident between ethnicity and GPA indicating that ethnicity may be a predictor of final cumulative GPA. A study by the National Center for Education Statistics (2006) found that “compared with their representation among all community college students, White students were overrepresented. . . . Specifically, some 60 percent of all community college students were White” (Executive summary, pp. vii-ix) . This is consistent with the predominantly European-American (92.7%) students in this study. Further research is needed to fully explore the impact of ethnicity on nursing student outcomes using a more ethnically diverse sample population.

Age produced a statistically significant, positive correlation with GPA. This finding implies that age may be a predictor for GPA or as a student’s age (in years) increases, final cumulative GPA will increase. As noted previously, the older, nontraditional age student may need more remedial education which would provide skills needed to be successful in nursing program courses and affect final cumulative GPA. Additionally, older students may be a more mature and motivated group than younger adult students and may put additional time and efforts in achieving successful outcomes, which would account for the higher than average NCLEX-RN pass rate (87.8%) and mean GPA (3.30).

**Research question 3b.** The final research question analyzed the relationships between age, gender, and ethnic group and the outcome of the outcome of NCLEX-RN performance. Regarding NCLEX-RN performance, there was a significant negative relationship between NCLEX-RN and ethnicity, and a significant positive relationship between NCLEX-RN and age.

As with GPA, however, none of the associations between the input variables and the outcome of NCLEX-RN performance were strong. The negative relationship between ethnicity and NCLEX-RN performance is consistent with the majority of the sample population being of European-American background. This finding implies that NCLEX-RN success may be negatively impacted based on ethnicity. Regarding the ethnic profile of the study population, being non-European-American may negatively impact NCLEX-RN outcomes.

Nursing program administrators and faculty must continue to examine the predictive relationship between remedial education and ADN student outcomes to effectively meet the needs of the ADN student and ensure successful pass rate performance on the NCLEX-RN examination. In this instance the strongest correlate to GPA was the incidence of MAT 050 as a remedial course. It is incumbent upon community college nursing administrators and faculty to explore methods for improving outcomes for ADN students through initiation and improvement of interventions for students in remedial education courses.

### **Issues and Limitations**

Motivational factors were not included in the study. Research comparing students who did and did not have to take remedial courses found that the academically underprepared students had less internal locus of control orientation, were more susceptible to test anxiety, and despite entering college to obtain a better job were less confident about their job prospects than their academically prepared peers (Grimes, 1997; Grimes & David, 1999). These characteristics might not be applicable to the ADN graduates who took remedial courses and who persisted to earn their degree. However, attributes such as self-efficacy and locus of control may be useful for distinguishing students who are at risk for dropping out of the nursing program or failing the NCLEX-RN early on in the program.

Techniques to reduce test anxiety are often used to help students pass the licensure exam (Schwarz, 2005). However, they would be more beneficial if the students were exposed to these techniques during their first semester (Davenport, 2007; Stuenkel, 2006). Stuenkel advocates early identification and intervention for students at risk for failing the licensure exam based on their pre-entry academic profiles. She suggests that students be reevaluated at the halfway point in the nursing curriculum using entrance qualifications, nursing course grades, and cumulative achievement test scores as criteria for determining whether they are in need of remediation.

GPA has previously been identified as a predictor of NCLEX-RN success (Daley et al., 2003; Schwarz, 2005). Waterhouse and Beeman (2003) indicated that a C average or lower on nursing courses was a warning of potential failure to pass the NCLEX-RN. Although most literature highlighted the association between GPA and success or failure on the NCLEX-RN, a study by Struenkel (2006) found that GPA alone was insufficient for predicting exam failure.

Several studies have found an association between nursing students' science grades and NCLEX-RN success (Potolsky et al., 2003; Stuenkel, 2006; Waterhouse & Beeman, 2003). Observing that many community college students experience problems with nursing science courses, Perin (2006) proposed that the difficulties may be due to inadequate preparation in science and mathematics. In view of Davenport's (2007) recommendation that NCLEX-RN preparation should be integrated with the ADN coursework from the first semester, and the findings of the present study regarding MAT 050, ADN students required to take remedial mathematics courses might be targeted for additional intervention from the time they are admitted to the ADN program.

Another possible reason for the weak relationships is that this study focused only on students who graduated from the ADN program and went on to take the NCLEX-RN. The vast

majority of students who drop out of nurse education programs, and drop out of higher education in general, do so within the first year (Levitz et al., 1999; Potolsky et al., 2003; Tinto, 1993). Students required to take a higher number of remedial courses have a lower probability of persisting to graduation (Hawley & Harris, 2006; Zhou, 1999). However, students who successfully complete remedial courses often perform as well or even better than students who take no remedial courses (Kolajo, 2004; Sinclair Community College, 1994). Although the rates of successful remediation vary among the campuses within the Ivy Tech Community College system, an average of 57.4% of students who take remedial courses successfully complete the course with a grade of A, B, or C. On a campus where 81% of the nursing students take at least one remedial course, Perin (2006) found that those who completed the remedial courses were likely to have graduated or were progressing in the program while students who failed to complete the remedial courses simply dropped out.

The population studied was fairly homogeneous. Had there been more male and minority students, the analysis might have produced more robust effects for gender and ethnicity. The main implication of the overwhelmingly female and European-American sample is that the Ivy Tech Community College system needs to reinforce efforts to increase the diversity of the nurse education program. Innovative efforts to attract younger students into the nursing profession have to be expanded and effectively targeted to attract more young men and more ethnic minority students. It is difficult to determine the extent of the actual impact of gender or ethnicity on performance on the licensure examination in a student population that is predominately European-American women.

### **Conclusions and Recommendations**

The high NCLEX-RN pass rates for the Ivy Tech Community College graduates in this study indicate that taking remedial courses is not an obstacle for successful performance on the licensure exam for ADN students who pass remedial coursework and persevere to earn their degree. The model tested by this study only focused on demographic characteristics as the input variables. This study did not examine factors such as self-efficacy or test anxiety, which have been found to affect NCLEX-RN performance (Schwarz, 2005). Critical thinking skills and performance in science courses are additional factors affecting NCLEX-RN success that could be included in future models based on Astin's (1993) I-E-O model for predicting ADN outcome performance.

According to findings from the High School Survey of Student Engagement (HSSSE; 2005), many college students need "an average of one or more years of remedial coursework because they are not adequately prepared for the level of academic challenge presented in the college curriculum" (HSSSE, 2005, p. 1). This finding has implications for individuals and may present a financial barrier for many. The need for extra income, part or full-time jobs and/or additional family pressures and responsibilities could significantly impact student performance. This is consistent with Hoyt (1999) and Bailey and Alfonso (2005) who identified financial aid as a primary issue related to weakened academic performance and/or failure to complete one's education. Perin (2006) noted that community colleges serving economically disadvantaged minority students should have an array of support services including counselors with expertise in working with that particular population mirroring findings from other studies.

Waycaster (2001) noted that improved outcomes were found for those students who successfully transitioned from developmental to college-level math courses. Students

completing a remedial math course also performed at the same level or higher in college level mathematics courses as compared to students exempt from developmental courses. Further, 3-year retention rates for the developmental students from across the five colleges were higher, ranging from 61.9% to 80.6% compared to 42.1% to 61.9% among the non-developmental students. Waycaster notes that added intervention for students in remedial education courses including “counseling, advising, teaching, and monitoring progress, as well as smaller classes, contribute greatly to this higher level of retention for developmental mathematics students” (Waycaster, 2001, p. 412).

These strategies are consistent with best practices in retention for two-year institutions (Habley & McClanahan, 2004). Waycaster (2001) found that the only developmental class with more than 25 students was in the college with the lowest retention, suggesting that small classes and individualized attention were important factors in retention. Students who had been in developmental courses accounted for 40% of the students who graduated, adding further support for the effectiveness of the developmental courses,

Although the correlations found in this study were weak, they have implications for nursing faculty and administrators. Graduate nurse failure of the NCLEX-RN examination affects the pool of qualified nurses to meet the healthcare needs of an aging population. Therefore, examination of the impact of demographic variables on the number and type of remedial courses taken by ADN students is important for nursing student success. Bailey and Alfonso (2005) note that developing methods to improve the effectiveness of remedial education is one of the most important and challenging issues facing community colleges today and conclude that community college administrators and counselors can assist poorly prepared students through provision of “extensive instruction in academic skills, advising, counseling and

comprehensive support services” (Bailey & Alfonso, 2005, p. 19). It is imperative to note the importance of counseling, advising and comprehensive support services in addition to the institutional provision of remedial coursework.

There are direct parallels between the strategies used to help students pass the licensure exam and the components of developmental education. Techniques for improving study skills and time management and reducing test anxiety, for example, could be presented to nursing students in a manner that aligns them more closely with the nursing curriculum. These interventions could assist in forging connections for students between the mastery of these skills, their academic performance at college, and their eventual success on the NCLEX-RN.

Several variables including an aging labor force, increasing life span and increasing diversity in the population with unequal representation in nursing will continue to impact the need for nurses in the U.S. (Reinhard et al, 2002). Age and ethnicity changes in the general population must be explored in relation to ADN education and programs. Nurse educators must continue to examine the impact of age, ethnicity and other demographic variables on nursing student outcomes. Implementation of strategies to meet the needs of non-traditional nursing students in community colleges and methods for increasing diversity in nursing are increasingly important. Recruitment initiatives must be expanded and efforts intensified to ensure nursing students successfully pass the NCLEX-RN examination and are available to meet the needs of the changing population (Lauchner et al, 2006; Newman et al., 2006; Nibert & Young, 2006; Nibert et al., 2002; Nibert et al., 2006).

The analyses showed that the relationships among the target variables were significant but weak. The findings suggest that the model has promise but would have to be refined and expanded to have stronger predictive power. Prior studies of nurse education students report

conflicting findings regarding the influence of factors such as gender, motivation, age, marital status, ethnicity, student goals, GPA, and the need for remedial education (Haas et al., 2004). In many cases, the sample size was limited, especially with respect to gender and ethnicity. In view of the gender and ethnic composition of the Ivy Tech Community College ADN students, this study shares that limitation. There are many input and environmental factors identified in prior research on college persistence, remedial education, and NCLEX-RN performance that were excluded from the present study but have the potential to add to these findings to create a more robust predictive model for the NCLEX-RN success of students enrolled in ADN programs.

A major flaw in current approaches to promoting NCLEX-RN success is that most strategies are not implemented until just prior to the examination (Davenport, 2007). Building on Davenport's (2007) recommendation that nursing programs should begin preparing students for the licensure examination from the time they enter the program, the students' status as needing or not needing remedial coursework may offer a starting point for targeting intervention. According to the standards of the Ivy Tech Community College system, students successfully complete remedial courses by earning a grade of A, B, or C. A study of developmental mathematics found that a B grade was the benchmark for successful completion of college coursework and persistence toward degree (Perkhounova et al., 2005). This study did not include the students' grades in remedial courses in the analysis although the inclusion criteria limited the sample to ADN students who persisted to graduation.

The findings of this study suggest that targeting early intervention to students required to take remedial mathematics courses might help additional ADN students achieve successful outcomes including first attempt passing scores on the NCLEX-RN licensure examination. It is also likely that the integration of strategies to help students pass the licensure exam into the

nursing curriculum would also increase the number of nursing students who complete the ADN program. Increasing retention and NCLEX-RN pass rates are both part of Davenport's (2007) concern, and a concern for the administrators of nurse education programs under accountability pressure.

Virtually all community colleges have a variety of learning supports including learning and study centers (Habley & McClanahan, 2004). Study groups are frequently used to help nursing students pass the NCLEX-RN (Davenport, 2007; Sayles et al., 2003; Sifford & McDaniel, 2007). Organizing study groups for nursing students who are enrolled in and who have completed remedial courses might be an effective technique for boosting the students' academic performance while preparing them for the exam. Study groups may be especially beneficial for minority students in nursing programs who often feel socially isolated (Nibert et al., 2006). Given their small numbers in nursing programs, male students may feel isolated as well. Activities that address academic issues while promoting social interaction, consistent with Tinto's (1993) theory, might be particularly helpful for students from underrepresented groups. Furthermore, in view of the older age of many nursing students and the status of nursing as a "hot program" and a "hot job" the integration of NCLEX-RN preparation into formal and informal study might have the psychological benefit of helping the students envision themselves as professionals. Identifying as a professional as well as a student could have positive effects on motivation and commitment to pass the professional exam.

The science intensive nature of nursing education often arises as an obstacle to students' success (Perin, 2006). Several studies have reported a connection between science grades and NCLEX-RN performance (Potolsky et al., 2003; Stuenkel, 2006; Waterhouse & Beeman, 2003). An expansion of the I-E-O model used in this study that includes students' science grades might

have greater predictive value. Lack of adequate mathematics preparation is often a factor in the struggles with science classes experienced by community college nursing students (Perin, 2006). Completing remedial mathematics courses may be advantageous for some students (Waycaster, 2001). Students who do not require remedial mathematics may still be lacking in skills that impede their performance in science.

Alternately, success in science courses may be independent from mathematics performance. Students who do well in some science courses may perform poorly in others (Potolsky et al., 2003). In their study of a tutoring program for BSN students enrolled in pharmacology and pathophysiology courses, Potolsky et al. found that the students actually did better in required science courses than in the target courses. The researchers pointed out that the basic science courses focused on knowledge retention while the nursing science courses demand the clinical application of knowledge. As a professional licensing exam, the NCLEX-RN is based on the clinical application of nursing knowledge. Students would benefit from interventions that assist them in applying knowledge to clinical situations.

Superior critical thinking skills are associated with NCLEX-RN success (Schwarz, 2005). This finding is consistent with the increased rigor of the NCLEX-RN and its redesign to reflect the demands of contemporary nursing practice. Developmental education also employs techniques to improve students' critical thinking skills (Boylan & Bonham, 2007). Collaboration between nurse educators and developmental educators to devise strategies specific for nursing students would provide a vehicle that could potentially boost the outcomes of both departments of the campus as a whole.

Other factors found to predict NCLEX-RN performance include students' grades in nursing theory and clinical courses and NLN achievement test scores (Barkley et al., 1998) and

grades on the final medical-surgical course, along with cumulative GPA (Daley et al., 2003). Earning a C or lower in nursing courses has been identified as a warning sign for potential failure on the licensing exam (Waterhouse & Beeman, 2003). Future research with the proposed model could include specific nursing courses as well as remedial courses, cumulative GPA, and NCLEX-RN performance in the analysis.

Sayles et al. (2003) found that among ADN graduates, ethnicity emerged as the only demographic factor to significantly affect NCLEX-RN performance, with minority students less likely to pass the exam than white students. Cultural diversity remains a prominent issue in nursing (Seago & Spetz, 2003) and remedial education (Boylan et al., 2005). Probably the best way to develop effective strategies for helping minority students persist in the program and pass the licensing exam is to solicit the input of the students themselves to design the most appropriate interventions. Supporting minority students in passing the NCLEX-RN must be embedded in broader efforts to attract and retain ethnically diverse students. According to Ortiz and Rhoads (2000), a multicultural educational framework is needed to address the interrelated issues of student diversity, workforce development needs, and a demographically changing general population.

The ADN graduates are not representative of the general Ivy Tech Community College population. Studies of ADN programs reveal substantial differences in the profiles of the students of individual programs. Even within the Ivy Tech Community College system, there are differences among the various campuses (Ivy Tech Community College, 2007b). Community colleges with the most successful retention initiatives tailor their programs to the unique characteristics of their students and campus (Habley & McClanahan, 2004). Effectively targeting interventions to the Ivy Tech Community College ADN students entails further

exploration of the sociodemographic and other attributes of the students, along with consideration of the direction of recruitment efforts. For example, the recruitment of more students just out of high school would result in a student enrollment whose needs for program success might differ dramatically from the current population of adult learners.

### **Summary**

There is empirical evidence that remedial programs for nursing students at risk for failing the NCLEX-RN are effective (Nibert et al., 2006; Nibert & Young, 2006; Sifford & McDaniel, 2007). In fact, there is less compelling evidence for the positive impact of remedial education (Hoyt, 1999; Perkhounova et al., 2005). The high first-time pass rates of the Ivy Tech Community College graduates, at least equivalent to the pass rates for graduates of BSN programs despite the fact that almost half the students took remedial courses, indicates that the remedial courses can successfully prepare students for future success. Nevertheless, in view of a number of factors, including the rising demand for RNs, the increasing sophistication of nursing, the status of Ivy Tech Community College as a key contributor to the regional workforce, and increasing accountability pressures on the college and the nursing program, there is a need to boost the first-time NCLEX-RN pass rates even higher. With interventions tailored to the demands of the more rigorous exam, the pass rates ideally should equal or surpass the pass rates for the mid-1990s before the exam was revised.

Failure to pass the NCLEX-RN has repercussions at multiple levels (Lauchner et al., 2006; Schwarz, 2005). At the societal level, the gap between nursing program graduation and licensure deprives the community of critically needed RNs. At the institutional level, low pass rates compromise the status and reputation of the nursing program. And at the individual level, students who fail the exam suffer economic and psychosocial consequences. Students who fail

the exam the first time have less chance of passing on the second attempt (National Council of State Boards of Nursing, 2008b).

As practice opportunities for nurses expand, it is likely the standards and competencies for passing the NCLEX-RN will be set even higher in the future. Furthermore, nursing programs, like all educational institutions, are under increasing scrutiny (Davenport, 2007; Lauchner et al., 2006; Newman et al., 2006). To meet the healthcare needs of Indiana's citizens, it is important that the Ivy Tech Community College system strive to maximize the number of ADN graduates who successfully pass the NCLEX-RN and go on to a career in professional nursing. Nurses who obtain their degrees at community colleges often intend to practice in that community (Medlyn, 2000). As a statewide community college system, Ivy Tech Community College plays a prominent role in workforce and economic development across Indiana. Ongoing research is needed exploring the interaction of factors affecting ADN students' performance on the NCLEX-RN. This study contributed to that effort by examining the impact of remedial education on nursing student success based on Astin's (1993) I-E-O model.

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**Appendix A: Sample NCLEX-RN Results Collection Form**

Unique ID	Campus ID	Campus Name	NCLEX-RN Pass	NCLEX-RN Fail	Did not take NCLEX-RN	Unknown
xxxxxx	E1C	Kokomo	X			
xxxxxx	E3C	Logansport		X		
xxxxxx	I1C	Richmond			X	
xxxxxx	M1C	Sellersburg				X

Note: This form is designed for the collection of first-time NCLEX-RN pass/fail test results for associate degree nursing graduates from your campus for the period 2004-2007. Please select only one of the four boxes for each name provided. The list of graduates was provided from the mainframe database by the Office of Institutional Research staff at Ivy Tech Community College.

## Appendix B: Ivy Tech Community College Institutional Review Approval for Research



November 25, 2008

Ms. Laurie Peters  
Program Chair  
School of Health Sciences  
Ivy Tech Community College  
700 E. Firmin Street  
Kokomo, IN 46902

Dear Laurie,

**Subject:** *"The Impact of Remedial Education on Nursing Student Outcomes"*  
HSRB # 07009

This is to provide an extension of the timeframe for you to complete your human subject research as earlier approved in September 2007. You may complete your research during the next 9 months.

Should you have any questions or concerns during this process, or should the research approach need to be modified, be sure to let us know. Any procedural modifications must be evaluated and approved prior to being implemented.

I'm assuming at this point that we have provided the data that you requested. If that is not the case, please contact me to discuss what is needed.

As before, we do ask that a copy of your final report be submitted upon completion to the Office of Institutional Research for our internal library of research. We hope things go well with your research and look forward to reviewing your findings.

Sincerely,

A handwritten signature in black ink, appearing to read "Karen A. Stanley".

Karen A. Stanley  
Executive Director of Institutional Research  
And Planning

cc: Human Subjects Review Board  
Chancellor Steve Daily  
Pam Lewis, Academic Dean

## **Appendix C: Ivy Tech Community College Associate Degree Nursing Curriculum**

### General Education Courses (21 Credits)

<u>Course Number</u>	<u>Course Title</u>	<u>Credit Hours</u>
ANP 101	Anatomy and Physiology I	3
ANP 102	Anatomy and Physiology II	3
BIO 211	General Microbiology	3
COM 101	Fundamentals of Public Speaking	3
OR		
COM 102	Interpersonal Communication	3
ENG 111	English Composition	3
MAT 111	Intermediate Algebra	3
PSY 101	Introduction to Psychology	3

### Professional/Technical Courses (40 Credits)

NUR 150	Nursing and Universal Needs	4
NUR 151	Nursing and Universal Needs Practicum	4
NUR 152	Nursing Related to Health Deviation I	5
NUR 153	Nursing Related to Health Deviation I Practicum	5
NUR 154	Pharmacotherapeutics	2
NUR 250	Nursing Related to Health Deviation II	5
NUR 251	Nursing Related to Health Deviation II Practicum	5
NUR 252	Nursing Related to Developmental Needs	4
NUR 253	Nursing Related to Developmental Needs Practicum	4
NUR 254	Professional Nursing Issues	2
xxxxxx	Locally Determined Courses	6-7

### Nursing Program Course Descriptions

Note - Course descriptions were taken from the 2006-2007 Ivy Tech Community College Course Catalog.

#### ANP 101 - Anatomy and Physiology I

Prerequisites: Demonstrated competency through appropriate assessment or earning a grade of "C" or better in ENG 025, ENG 032, and MAT 044. Develops a comprehensive understanding of the close inter-relationship between anatomy and physiology as seen in the human organism.

Introduces students to the cell, which is the basic structural and functional unit of all organisms, and covers tissues, integument, skeleton, muscular and nervous systems as an integrated unit.

#### ANP 102 - Anatomy and Physiology II

Prerequisites: ANP 101 and demonstrated competency through appropriate assessment or earning a grade of “C” or better in MAT 050. Continues the study of the inter-relationships of the systems of the human body. Introduces students to the study of the endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary and reproductive systems.

#### BIO 211 - General Microbiology

Prerequisites: BIO 101 or ANP 101 and earning a grade of “C” or better in MAT 050. An overview of microbiology including fundamental structures of microorganisms, their metabolism, classification and interaction with other living things, and the laboratory techniques for their study. Introduces industrial and clinical applications of microbiology.

#### COM 101 - Fundamentals of Public Speaking

Prerequisites: Demonstrated competency through appropriate assessment or earning a grade of “C” or better in ENG 025 and ENG 032. Introduces fundamental concepts and skills for effective public speaking, including audience analysis, outlining, research, delivery, critical listening and evaluation, presentational aids, and use of appropriate technology.

#### COM 102 - Interpersonal Communication

Prerequisites: Demonstrated competency through appropriate assessment or earning a grade of “C” or better in ENG 025 and ENG 032. Focuses on the process of interpersonal communication as a dynamic and complex system of interactions. Provides theory, actual practice, and criticism for examining and changing human interactions in work, family, and social contexts. Includes topics such as perception, self-concept language, message encoding and decoding, feedback, listening skills, conflict management, and other elements affecting interpersonal communication.

#### ENG 111 - English Composition

Prerequisites: Demonstrated competency through appropriate assessment or earning a grade of “C” or better in ENG 025 and ENG 032. Designed to develop students’ abilities to think, organize, and express their ideas clearly and effectively in writing. This course incorporates reading, research, and critical thinking. Emphasis is placed on the various forms of expository writing such as process, description, narration, comparison, analysis, persuasion, and argumentation. A research paper is required. Numerous in-class writing activities are required in addition to extended essays written outside of class.

#### MAT 111 - Intermediate Algebra

Prerequisites: Demonstrated competency through appropriate assessment or a grade of “C” or better in MAT 050. Reviews basic operations of polynomials, scientific notation, linear equations and inequalities, graphing linear equations, and factoring algebraic expressions. Concentrates on properties of integer and rational exponents, rational expressions and equations, systems of linear equations, radicals, radical equations, quadratic equations, functions and their graphs, and applications. A standard college level intermediate algebra course.

### PSY 101 - Introduction to Psychology

Prerequisites: Demonstrated competency through appropriate assessment or earning a grade of “C” or better in ENG 025, ENG 032, and MAT 044. Surveys behavior and cognitive processes as they affect the individual. The course focuses on biological foundations, learning processes, research methodologies, personality, human development and abnormal and social psychology.

### NUR 150 - Nursing and Universal Needs

Prerequisites: Admission to Associate of Science in Nursing Program. Co-requisite: NUR 151. Provides fundamental facts, concepts, principles, and rationales necessary to meet universal healthcare needs. Introduces the five components of nursing process and the roles of the associate degree nurse.

### NUR 151 - Nursing and Universal Needs Practicum

Prerequisites: Admission to Associate of Science in Nursing Program. Co-requisite: NUR 150. Simulated and actual patient care situations provide an opportunity to develop interpersonal and psychomotor skills. Initiates a beginning level of assessing, analyzing, planning, implementing, and evaluating therapeutic measures in meeting basic universal healthcare needs. Provides an opportunity in the laboratory and clinical setting to explore the role of the associate degree nurse.

### NUR 152 - Nursing Related to Health Deviation I

Prerequisites: NUR 150 and NUR 151. Co-requisite: NUR 153. Defines the role of the associate degree nurse in assisting adult clients experiencing health deviation related to nutrition/elimination, rest/activity, safety, and homeostasis. Utilizes the nursing process to describe promotion, maintenance, and restoration of health or the support of death with dignity.

### NUR 153 - Nursing Related to Health Deviation I Practicum

Prerequisites: NUR 150 and NUR 151. Co-requisite: NUR 152. Provides experience that enables the student to progress in the role of the associate degree nurse when providing care to adult clients experiencing health deviation. The nursing process guides the application of scientific facts, concepts, principles and rationales in the delivery of nursing care. Advanced psychomotor skills and appropriate therapeutic communication are also emphasized.

### NUR 154 - Pharmacotherapeutics

Prerequisites: Program Advisor Approval. Introduces the student to the fundamental principles of drug action, the classification of drugs and the appropriate nursing actions to achieve the desired outcomes of therapy. The nursing process as a framework for learning is integrated throughout the course.

### NUR 250 - Nursing Related to Health Deviation II

Prerequisites: NUR 152 and NUR 153 or NUR 248. Co-requisite: NUR 251. Defines the role of the associate degree nurse in assisting clients experiencing health deviation related to oxygenation, social interaction/solitude and continued health deviation of safety and homeostasis. The nursing process with emphasis on planning, intervention, and evaluation is

utilized to promote, maintain, and restore health or support death with dignity in the adult client. Leadership skills and advanced therapeutic communication are also emphasized.

#### NUR 251 - Nursing Related to Health Deviation II Practicum

Prerequisites: NUR 152 and NUR 153 or NUR 248. Co-requisite: NUR 250. Provides experiences that allow the student to further refine the role of the associate degree nurse when providing care to clients experiencing health deviation. The nursing process guides the application of scientific facts, concepts, principles and rationales in the delivery of nursing care. Leadership skills and advanced therapeutic communication are also applied.

#### NUR 252 - Nursing Related to Developmental Needs

Prerequisites: NUR 152 and NUR 153 or NUR 248. Co-requisite: NUR 253. Identifies the role of the associate degree nurse in assisting childbearing and childrearing families to meet their developmental needs which include the maintenance of conditions to support life processes and maturation. Utilizes the nursing process to describe promotion, maintenance, and restoration of health or the support of death with dignity.

#### NUR 253 - Nursing Related to Developmental Needs Practicum

Prerequisites: NUR 152 and NUR 153 or NUR 248. Co-requisite: NUR 252. Provides experiences that allow the student to further refine the role of the associate degree nurse when providing care to meet the developmental needs of childbearing and childrearing families including the maintenance of conditions to support life processes and maturation. The nursing process guides the application of scientific facts, concepts, principles, and rationales in the delivery of nursing care. Decision making and therapeutic communication are also emphasized.

#### NUR 254 - Professional Nursing Issues

Prerequisites: Program Advisor Approval. Examines issues and nursing's responsibility to meet changing needs of persons in their environment. Historical aspects, current developments, future trends, improvement of nursing practice, legal/ethical considerations, and personal/professional growth are integrated into the examination of the role of the associate degree nurse.

### Appendix D: Ivy Tech Community College Remedial Education Course Descriptions

<u>Course Number</u>	<u>Course Title</u>	<u>Credit Hours</u>
ENG 024	Introduction to College Writing I	3
ENG 025	Introduction to College Writing II	3
ENG 031	Reading Strategies for College I	3
ENG 032	Reading Strategies for College II	3
MAT 044	Mathematics	3
MAT 050	Basic Algebra	3

#### Course Descriptions

##### ENG 024 - Introduction to College Writing I

Prerequisites: Demonstrated competency through appropriate assessment. Enables the beginning college writer to develop control of the writing process by focusing on paragraph development. Requires students to demonstrate proficiency in basic standard writing conventions, including grammar and mechanics. Prepares students for entry into ENG 025.

##### ENG 025 - Introduction to College Writing II

Prerequisites: Demonstrated competency through appropriate assessment or earning a grade of "C" or better in ENG 024. Builds on the competencies learned in ENG 024 and prepares students for entry into college level composition by focusing on essay development. Enables beginning college writers to expand control of the writing process. Requires students to demonstrate increased proficiency in the use of standard writing conventions. Introduces the processes of research and documentation.

##### ENG 031 - Reading Strategies for College I

Prerequisites: Demonstrated competency through appropriate assessment. Increases performance in reading flexibility, vocabulary, and comprehension. Introduces critical reading skills and study strategies and their applications.

##### ENG 032 - Reading Strategies for College II

Prerequisites: Demonstrated competency through appropriate assessment or earning a grade of "C" or better in ENG 031. Advances performance in reading flexibility, vocabulary, and comprehension. Emphasizes critical reading and strategies for effective study of college level text.

**MAT 044 - Mathematics**

Prerequisites: Demonstrated competency through appropriate assessment or earning a grade of “C” or better in MAT 040. Reviews basic operations with fractions, decimals and their applications. Concentrates on ratio, proportion, percents, measurement, geometric concepts, signed numbers, interpreting and constructing graphs, basic linear equations, and applications. A developmental mathematics course.

**MAT 050 - Basic Algebra**

Prerequisites: Demonstrated competency through appropriate assessment or earning a grade of “C” or better in MAT 044. Reviews signed numbers and basic linear equations. Concentrates on integer exponents, scientific notation, linear equations and inequalities, literal equations, polynomial operations, polynomial factoring, graphing linear equations, and applications. A developmental algebra course.