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Predicting Registered Health Information Administrator Examination Scores

James Condon

PREDICTING REGISTERED HEALTH INFORMATION ADMINISTRATOR EXAMINATION SCORES

By

JAMES CONDON

(Under the Direction of Yasar Bodur)

ABSTRACT

The purpose of this study was to determine whether differences existed among candidates for the Registered Health Information Administrator certification examination that may have characterized the likelihood of acquiring professional certification upon graduation from accredited health information administration education programs. The research was conducted using data acquired from accredited health information administration education programs located across the United States. A total of 197 former student records were obtained and used in the statistical analyses; 118 were employed in correlation analysis and to develop a Registered Health Information Administrator certification examination success prediction model and to establish a 95% Approximate Prediction Interval, while the remaining 79 records were used to validate the success prediction model.

Ten independent variables were evaluated: race, ethnicity, mother tongue, age, four professional course grades, and two grade point averages. The dependent variable was the graduate's raw score of the first attempt on the Registered Health Information Administrator certification examination. Results of Pearson product-moment correlation coefficient computations revealed that final course grades in Coding and Introduction to Health Information Administration and professional curriculum grade point average were

strongly associated with the Registered Health Information Administrator examination score. In addition, final course grade in Medical Terminology, core curriculum grade point average, and mother tongue were moderately associated with the Registered Health Information Administrator examination score.

Multiple regression analysis was employed to establish a prediction model for score on the Registered Health Information Administrator certification examination. Subsequently, a 95% Approximate Prediction Interval was computed. A separate sub-sample of former student data was then employed to test the prediction model; 91.1% of the actual RHIA certification examination raw scores fell within the 95% Approximate Prediction Interval.

INDEX WORDS: Registered Health Information Administrator examination, RHIA exam, Professional certification examination success formula, Success prediction model, Approximate prediction interval, Student academic variables, Student demographic variables

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By

JAMES CONDON

B.S., Medical College of Georgia, 1997

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JAMES CONDON

Major Professor:	Yasar Bodur
Committee:	Teri Denlea Melton
	Bryan Griffin

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DEDICATION

I would like to dedicate this dissertation to two people who have inspired me to keep plugging away on this study, especially when I would have rather been doing something else: my wife Karin and my daughter Melissa. And to our puppy dog Patches: thanks for keeping me company during the countless hours I spent at my desk. Woof!

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The relationship between a patient and his or her health care provider, whether the provider is a doctor, nurse, therapist, or one of a host of other health care professionals, is one of trust, intimacy, and mutual respect (Collier, 2012; Kaba & Sooriakumaran, 2007). Health care providers are carefully selected, thoroughly trained, and highly proficient in treating the patient's condition. It is the health care provider in whom millions of Americans entrust their health and, in many cases, their lives (Mechanic, 2004). A health care provider's expertise is a result of obtaining, as a foundation, a quality educational experience from an accredited professional program. Skills developed over time and practice lead to clinicians who become experts (Nardi & Kremer, 2003). The educational leader is responsible for providing a quality education program that will serve as the expert clinician's foundation.

Professional Programs in the Health Care Disciplines

In institutes of higher education where health care professionals are prepared, educational leaders are charged with a number of responsibilities. One of the most important of these responsibilities is to ensure that each graduate of the professional programs for which the leader is responsible is academically prepared to successfully pass the profession's licensing or certification examination (Hoy & Miskel, 2008). Program accrediting bodies, graduate credentialing agencies, alumni, deans, and professional associations each have their own interests in a program's degree of success at preparing graduates who can successfully pass the professional certification examinations (Eaton, 2001; Sandmann, Williams, & Abrams, 2009).

Low passing rates are of concern for several reasons. First, low passing rates on professional licensing examinations for health care providers delay the entry of qualified candidates into the field, thereby exacerbating the problems caused by the shortage of providers. Second, failure on a professional examination is an experience that may negatively affect a candidate's self-confidence, vital for professional competence. In addition, failure leads to delayed career plans and potential financial difficulties for the candidate. Finally, excessive examination failures by graduates of a professional program can lead to increased scrutiny of the program and, in extreme cases, loss of program accreditation (Maize, Fuller, Hritcko, Matsumoto, Soltis, Taheri, & Duncan, 2010; Sifford & McDaniel, 2007). A consistently excessive number of examination failures places continued program accreditation at risk. Regaining program accreditation is often an arduous course of action, requiring the expenditure of valuable resources on reaccreditation instead of on the students and the education process (Glenn, 2011).

To accurately predict the likelihood of a professional program applicant or student successfully completing a rigorous professional course of study and a program graduate passing the subsequent certification or licensing examination, a number of success assessment tools, such as course examinations, thematic reports, personal interviews, letters of recommendation, and "mock" professional certification examinations are available to program directors and instructors. However, the results of such assessments do not always accurately predict whether a graduate of a program will succeed on the professional certification examination (Siu & Reiter, 2009; Wright & Henzi, 2007). Some graduates who have displayed competence in professional examination preparatory

activities subsequently take the professional examination and fail it, thereby decreasing the program's examination passing rate.

In an effort to increase their passing rates, educational program researchers in several disciplines, such as nursing, education, chiropractic, and dental hygiene, whose graduates require professional certification, have effectively produced success prediction formulas or models (Green, Johnson, & McCarthy, 2003; Griffiths, Bevil, O'Connor, & Wieland, 1995; Henderson & Orr, 1989; Ward, Downey, Thompson, & Collins, 2010; Wilmore & McNeil, 2002). Linear regressions have been utilized to generate predictive models for professional examination raw scores. These models may quantitatively determine the degree to which an applicant, student, or graduate is likely to succeed on the discipline's professional certification examination.

Professional Programs in Health Information Administration

Higher education programs in the health information administration profession are also subject to the same intense scrutiny as other health care disciplines and, if found not achieving standards set forth by the accrediting body, could suffer loss of program accreditation. One of the areas examined by the health information administration education program accrediting body is the degree of success of each health information administration program's graduates on the professional certification examination. Because of the relatively small number of health information administration education programs and their small class sizes, coupled with the ever-increasing demand for certified health information administration professionals, even just one program losing its accreditation negatively impacts the profession as positions for graduates of accredited health information administration programs go unfilled. This, in turn, adversely impacts

the quality of health care delivered to patients (Spath, 2009). Therefore, to help maintain effective health care delivery, health information administration educational leaders are challenged to ensure that their programs remain accredited and that their graduates are successful.

Perhaps because of health information administration's relatively small professional cadre and its paucity of professional education programs, no success prediction model has yet been identified. In fact, an extensive literature review revealed only one study in which potential success predictor variables were assessed; results of the study found no predictor values that were statistically significant (McNeill & Brockmeier, 2005). Clearly, this is a topic that requires further research in order to address this deficiency in the profession's knowledge base; additional research directed toward this area could potentially identify a success prediction model and its subsequent employment by health information administration higher education leaders.

Statement of the Problem

As academic leaders, directors of Bachelor of Science degree in health information administration programs are responsible for creating a curriculum that fosters success by their program graduates on the professional certification examination, the Registered Health Information Administrator certification examination ("Academic Director," 2011). Program directors, however, have no quantitative assessment model that can be used to evaluate the extent of each student's level of preparation. If such a model were available, the results of its employment might suggest to whom additional instruction could be targeted or might more accurately predict the likelihood of a specific student passing or failing the profession's certification examination. Although other

professions, such as nursing and education, have conducted extensive research in this area and have developed success prediction models, this area of the health information administration profession has barely been investigated. Since no such assessment model in the health information administration educator's tool box currently exists, health information administration education leaders, program directors, and faculty must depend upon both subjective and objective criteria that are often inaccurate or inconsistent at determining the student's likelihood of successfully completing the professional certification examination.

Currently, the demand for certified health information administration professionals is high and future demand is predicted to only increase (U.S. Department of Labor, 2009). Students currently completing health information administration education programs and graduates of health information administration education programs who have been identified as academically weaker than their peers or who have been pinpointed as poor test takers frequently fail the Registered Health Information Administrator certification examination, thereby lowering the program's graduate passing rate for first time examination takers. Further, because acquiring the Registered Health Information Administrator certification is not a requirement to work professionally in health information administration, some of the academically weaker graduates have opted not to take the examination at all. Although these graduates may still work in any position in the health information profession, many of them will not be eligible for positions where employers mandate professional certification. Whereas low test-taking rates are not evaluated by the program accrediting agency, low examination passing rates are. As a result of substandard passing rates, health information administration education programs

risk losing accreditation; the leaders of these programs must then immediately initiate programmatic changes and elevate these rates for future graduates. When graduates opt not to take the Registered Health Information Administrator certification examination, the health care delivery system suffers as important health information administration and technology positions go unfilled or are filled by graduates who are not certified or by individuals with no health information administration background.

The study's objective was to establish whether a quantitative assessment model could be created by examining ten academic and demographic variables; the use of such a model could identify students in need of remediation, thus raising the passing rate of graduates on the Registered Health Information Administrator certification examination and increasing the number of graduates who take the Registered Health Information Administrator certification examination.

Research Questions

This study addressed the following overarching research question: What differences, if any, exist among candidates for the Registered Health Information Administrator certification examination that may characterize the likelihood of acquiring professional certification?

The following subquestions were investigated to answer the overarching research question:

1. Which individual student demographic variables correlate with a passing score on the Registered Health Information Administrator examination?
2. Which individual student academic variables correlate with a passing score on the Registered Health Information Administrator examination?

3. Can a Registered Health Information Administrator examination success prediction model be identified?

Conceptual Framework

A conceptual framework is described as "…a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation" (Smyth, 2004, p. 167). The conceptual frameworks used to guide this study were Wholey's (1987, 1994) model of program evaluation and the HIM Education Conceptual Model (McNeill & Brockmeier, 2005). McNeill and Brockmeier have described an educational program as a process composed of resources and events focused on the achievement of a goal or series of goals. Within the context of successful outcomes on the Registered Health Information Administrator certification examination, the authors have further hypothesized that four interrelated components of a health information administration educational program influence the degree of graduate success: the amount of program resources, the degree of faculty expertise, the employment of an appropriate curriculum, and a suitable cohort of students.

While the study by McNeill and Brockmeier (2005) primarily examined program resources, faculty expertise, and aspects of the curriculum, the scope of evaluating individual student characteristics was limited. Therefore, a comprehensive review of the literature was focused on previous research from multiple disciplines in which researchers identified student attributes that had successfully demonstrated various degrees of correlation with successful outcomes. Figure 1 depicts the conceptual model used in this study, adapted from the model proposed by McNeill and Brockmeier (2005).

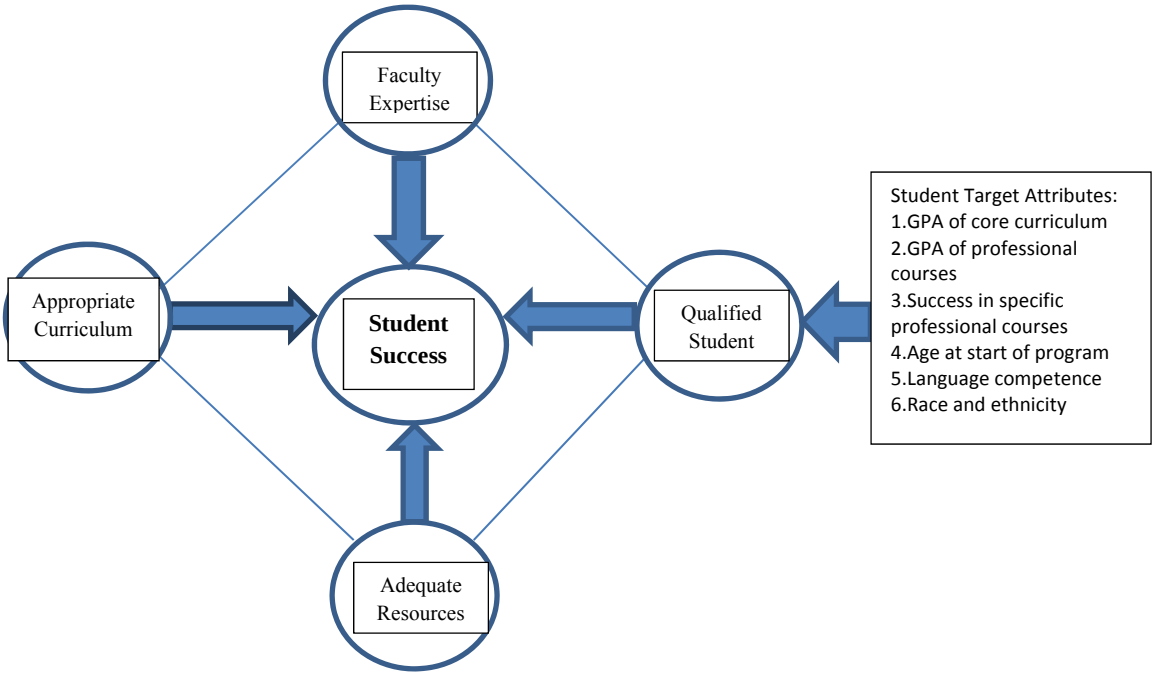

Figure 1. Conceptual framework depicting components for student success. Student target attributes are evaluated to determine the extent to which a student is prepared to successfully complete the Registered Health Information Administrator examination. Adapted from Wholey's model of program evaluation (1987, 1994) and McNeill and Brockmeier's HIM Education Conceptual Model (2005).

Significance of the Study

This study was important for several reasons. First, for education leaders and program directors of Bachelor of Science degree in health information administration and post-baccalaureate certificate in health information administration programs, a model might be developed that could aid faculty in determining whether a student would be likely to pass the Registered Health Information Administrator certification examination. The passing rate is one of the key measures by which the quality of a health information administration program is evaluated by accrediting bodies, university administrators, boards of regents, and potential students. Education leaders are charged with building a

program that maximizes the passing rate of their program graduates. To this time, no such model for analyzing student academic and demographic attributes and graduate examination readiness had been identified.

This study was also important for recruiting purposes. In the United States, potential students can select from the relatively limited number of around fifty Bachelor of Science degree in health information administration and post-baccalaureate certificate in health information administration programs. The program's passing rate on the Registered Health Information Administrator certification examination is frequently used as a benchmark by potential students as they investigate and select into which health information administration program they decide to matriculate.

Education leaders in Bachelor of Science degree in health information administration and post-baccalaureate certificate in health information administration programs will also find this study important. In the current fiscal environment where budgets are already tight and shrinking more each year, the ability of health information administration education leaders to demonstrate unequivocal success by program graduates on professional certification examinations could impact not only program budgets for future years, but also the very existence of the programs themselves.

Finally, Registered Health Information Administrators positively impact the delivery of health care by providing accurate and reliable health care data and by optimizing the amount of reimbursement obligated to health care providers. As a result, Registered Health Information Administrators positively influence patient care and contribute to ensuring the fiscal survivability of the health care organizations for which they are employed. This optimal situation can only occur, however, when there are

enough Registered Health Information Administrators to fill positions that are currently vacant and that are predicted to open in the future. Identifying a success prediction model would increase the number of graduates who would be appropriately prepared to pass the Registered Health Information Administrator certification examination on the first attempt. It is hoped that the results of this study will create an environment whereby vacant positions and future demand may be met.

Limitations and Delimitations

All research contains certain weaknesses in the study design; the proposed study was no exception. In other professions, similar research addressing this subject has been performed; however, very few studies have evaluated health information administration education and predictors of success on the Registered Health Information Administrator (RHIA) certification examination. However, as a result of similar studies conducted in other professions and detailed in the literature review, a number of student-focused academic and demographic variables for statistical analysis have been identified. The study population consisted of the records from graduates of health information administration programs located throughout the United States. Because the delivery of some of the programs under study were also offered online, which is a particularly convenient method of course delivery for the non-traditional student, it was possible that a higher number of program graduates were older and more mature than one would typically expect to find from programs that were exclusively offered in a traditional face-to-face classroom setting. Consequently, it was anticipated that the age difference and maturity level between the two groups may influence variables such as the graduate's grade point average on admission, program grade point average, and final course grades.

According to the Website America.gov, nontraditional students approach the actions reflected by these variables from a different point of reference than traditional students (U.S. Department of State, 2008). For example, nontraditional students, who may have families, increased responsibilities, and liabilities, and who have experienced life outside the walls of academic institutions, are more likely to anticipate a professor who is more serious and who offers a greater intellectual challenge. Traditional students, on the other hand, often view college as an extension of high school, desiring professors who are more lenient, and who offer fun as part of the class (U.S. Department of State, 2008).

Due to deliberate choices, this study was delimited in several ways. The study examined data from health information administration academic programs from across the United States. There were over fifty programs that offered a path to eligibility to take the RHIA examination; however, not all programs employed the same academic model. For example, some programs offered the "2 + 2" model, some used the traditional four-year model, and others might have employed the "4 + 1" model. Therefore, the results were not exactly representative of any one specific model, but rather more generally reflective of all programs. However, since all accredited health information administration programs must follow the same academic guidelines and were evaluated by the same accrediting body, using the results of this study could be helpful with establishing general academic benchmarks for all programs, regardless of the model employed.

The study sample was limited to graduates' first attempt on the Registered Health Information Administrator certification examination. Unlike graduates of other health care-related academic programs, graduates of health information administration programs

are not required to attain the Registered Health Information Administrator credential in order to practice professionally. However, limiting the study to graduates who had taken the RHIA certification examination also shrank the size of the study sample.

It was assumed that the data reflected in the graduates' academic records were accurately entered by the institution's administrative staff. It was further assumed that appropriate security measures were in place to prevent data stored in the institution's database from being tampered with; hence, the data were assumed to be reliable and accurate reflections of each graduate's tenure in the program.

Definition of Terms

For the purpose of this study, important terms are defined as follows:

American Health Information Management Association (AHIMA): AHIMA is the national professional association of individuals who are associated with the health information administration profession. It is composed of 52 state component associations; each of these state component associations is comprised of a number of regional associations (American Health Information Management Association, 2011a).

Health Information Administration: Health Information Administration is an allied health profession that is responsible for ensuring the availability, accuracy, and protection of clinical, demographic, and financial information obtained during the process of providing patient care. This information is used by health care providers to augment decision making during the provision of patient care, by health care administrators making decisions regarding business-related matters, and by public health agencies as they plan population-based health care strategies (American Health Information Management Association, 2011a)

Human Assurance Committee: The Human Assurance Committee is the Georgia Health Sciences University's version of an Institutional Review Board. In general, it functions similarly to an Institutional Review Board (Georgia Health Sciences University, 2011).

Pathophysiology: Pathophysiology is a course in the Georgia Health Sciences University's Bachelor of Science degree in Health Information Administration and Post-baccalaureate Certificate in Health Information Administration program curricula. The topic of pathophysiology is disease processes in humans (Thomas, 1997).

Registered Health Information Administrator (RHIA): The RHIA is the professional certification awarded to graduates of accredited Bachelor of Science degree in Health Information Administration and Post-baccalaureate Certificate in Health Information Administration programs who pass the Registered Health Information Administrator certification examination. Professionals who are in possession of this certification are also referred to as Registered Health Information Administrators (American Health Information Management Association, 2011b).

Chapter Summary

The purpose of this study was to investigate whether success predictors for students and graduates of accredited health information administration academic programs could be identified. These success predictors can then be applied to enhance the passing rates of graduates on the Registered Health Information Administrator certification examination. No such success predictors were available to education leaders in the health information administration profession; consequently, a void in the literature existed.

This study employed a correlational research design. Data elements from a sample of graduates of several Bachelor of Science degree in Health Information Administration and Post-baccalaureate Certificate in Health Information Administration programs were obtained. These data were de-identified and used for further analysis. Pearson's product-moment correlation coefficient and multiple linear regression were calculated using SPSS (Statistical Package for the Social Sciences) and Excel 2010 software.

CHAPTER II

REVIEW OF RESEARCH AND RELATED LITERATURE

For many years, investigators in academic disciplines have conducted research in an attempt to identify variables or combination of variables that might accurately predict student and graduate success on professional certification examinations (Waterhouse & Beeman, 2003). The literature is replete with studies in which researchers attempted to identify cognitive, non-cognitive, academic, demographic, and programmatic variables or attributes that might accurately predict successful outcomes.

Attempting to identify measures of a student's potential success is by no means a phenomenon exclusive to one or two disciplines. A review of the literature included an examination of higher education programs in general, and a more specific evaluation of health care-related academic programs. The review focused on studies that attempted to identify success predictors and variables, both cognitive and non-cognitive; in addition, other relevant findings and conclusions were noted, all of which served to inform the research methodology.

Program Assessment in Higher Education

Burke and Wang (2010), who examined methods of student assessment used by teachers in an elementary school setting, remarked that the ability to accurately measure academic abilities of students "…is a key factor in raising student achievement" (p. 658). Excellence in teaching, the researchers further stated, is the product of teachers who methodically evaluate the learning processes of their students then use the results to inform instruction. Allen (2004) suggested that when viewed within the framework of faculty members appraising their impact on students, program assessment is viewed as a

best practice in post-secondary education. An educational program's ability to quantitatively gauge a student's likelihood of success and to devise an appropriate course of action based on the results enhances student outcomes, and positively impacts its students, the program, and the future settings into which the students enter after graduation (Maize et al., 2010).

The higher education community, in a wide array of disciplines at all levels, has engaged in quantitative assessment activities in its quest to determine whether students are poised for positive outcomes. When weaker students are identified during the early stages of their academic programs, education leaders are empowered to initiate appropriate remediation. This, in turn, spawns an increased number of successful outcomes as students perform better, graduate on time, and are more ably prepared to start their professional careers (Bettinger & Long, 2009; Cleland, Milne, Sinclair, & Lee, 2008). In addition, the institution derives benefits including increased tuition revenue when students are charged for remediation, an enriched campus culture as students remain in the program, and the formation of a broader alumni base whose members give back to the institution (Maize et al., 2010).

Graduate and Undergraduate Programs and Success Predictors

A throng of academic programs have examined various individual and academic attributes of students in an attempt to predict outcomes. For example, graduate programs in criminal justice (McKee, Mallory, & Campbell, 2001; Reisig & DeJong, 2005) investigated whether predictive relationships existed between Graduate Record Examination (GRE) scores, graduate grade point average (GGPA), and prior grade point average (PGPA). Both studies found that the combination of PGPA and GRE scores

served as a fairly strong predictor of academic success. Similarly, Platt, Turocy, and McGlumphy (2001) examined the presence of significant relationships between preadmission criteria and graduation success in an athletic training program. Using the Pearson product-moment correlation coefficient, the researchers concluded that only the high school grade point average was moderately predictive of student success ($r = .384$, $p = .00$). Researchers in disciplines as diverse as computer science (Fan, Li, & Niess, 1998), professional counseling (Schmidt, Homeyer, & Walker, 2009), economics (Grove, Wasserman, & Grodner, 2006), psychology (Ridgell & Lounsbury, 2004), and business (Pomykalski, Dion, & Brock, 2008; Sulaiman & Mohezar, 2006) have all investigated whether certain student demographic or academic variables, when subjected to statistical analysis, may point to the likelihood of student success. The results of these investigations have varied; all of the predictor variables that were identified and analyzed revealed weak to moderate correlation coefficients.

Colleges of Education Programs and Success Predictors

Research by educators at the university level, some of whom were charged with discovering methods to increase primary- and secondary-level teacher competence, have produced mixed results in attempting to identify the optimal level of student teacher preparation as well as in trying to determine whether teacher program candidates should be more selectively screened (Denton et al., 2009). During the last fifteen years, education researchers evaluated whether individual student teacher attributes might have indicated the likelihood of success on teacher certification results. White and Burke (1994) studied two separate groups of student teachers to ascertain whether significant correlations existed between student teachers' SAT scores, general education courses

grade point averages (GE-GPA), and the Professional Development portion of the state of Texas' Examination for Certification of Educators in Texas (ExCET) scores. The ExCET scores were the most important criteria for licensure of elementary- and secondary-level teachers.

In the first group of student teachers (N=105), the correlation coefficient of ExCET scores in Professional Development and the GE-GPA, at the $p < .01$ level, was moderate at .441 (White & Burke, 1994). According to Cohen (1988), a coefficient of .10 represents a weak correlation, a coefficient of .30 represents a moderate correlation, and .50 represents a strong correlation. For the same group, the researchers found a weak correlation coefficient of .264 ($p < .01$) between ExCET scores and SAT scores. In the second group (N=135), the correlation coefficient of ExCET scores in Professional Development and the GE-GPA revealed a strong correlation of .608 ($p < .01$); the correlation coefficient of ExCET scores and SAT scores was moderate at .468 ($p < .01$). The researchers concluded that the SAT score was a "significant predictor" of the ExCET score (White & Burke, 1994, p. 299).

In a study involving newly graduated teachers, all of whom had successfully passed certification examinations, Blue, O'Grady, Toro, and Newell (2002) investigated the relationship among GPA, SAT scores, and Praxis I and II test scores for graduates of a traditional undergraduate teacher education program in Pennsylvania. The Praxis Series assessments are teacher licensure and certification products that survey the skills and knowledge of teacher candidates. A host of states and professional associations use the Praxis Series as part of their teacher certification processes (Educational Testing Service, 2011). Results of this study, based on 328 Elementary Education majors, revealed a

strong correlation of .690 between the General Knowledge test of the Praxis Series and SAT scores. This suggested that SAT scores were a good predictor of success on at least one component of the certification exam (Blue et al., 2002). In fact, the correlations of all the SAT scores (verbal, math, and total) and GPA at graduation with the various Praxis Series test scores were consistently moderate to strong at .4 to .6, similar to the results of data which had been found in previous research studies. The researchers noted, however, that students who had lower SAT scores, GPA, or state licensing test results, or who had varying combinations of the three, were just as successful as their classmates with higher scores in completing the same Praxis requisites. The researchers cautioned that using higher SAT scores or GPA as significant determinants of program admission may overlook potentially successful students whose scores are not quite as robust and that other variables, which the authors describe as "…factors, characteristics, dispositions, and the like that make [students] successful" should be more closely examined (Blue et al., 2002, p. 8).

Wilmore and McNeil (2002) conducted a five-year analysis of student variables as predictors of success on certification examination results. This study focused on the increasing shortage of certified school administrators in Texas and the difficulty that was being experienced in attracting candidates at both the elementary and secondary school levels. Successful completion of the ExCET was required for school administrator candidates seeking initial or additional certification. At the time, universities in Texas had been under heavy accountability pressure to graduate candidates who could pass the ExCET, not only as an entire group, but also by racial and gender subgroups. If an institution failed to achieve a pre-determined benchmark pass rate, an additional program

review was mandated; continued failure to achieve the benchmark caused the institution to be stripped of its ability to offer certifications. The subsequent discussions regarding the increased degree of accountability provoked conflicting viewpoints on issues of program equity, such as instructional delivery systems, the definitions of low-risk and high-risk applicants, and the issue of who should be admitted to the programs and the conditions under which admission should occur (Wilmore & McNeil, 2002). The result of Wilmore and McNeil's (2002) research produced a regression model that, when populated with the candidate's sex, ethnicity, GPA score and GRE score, was 90.9% effective in correctly predicting whether a student candidate would pass the ExCET. The use of the success prediction model, according to the researchers, could facilitate probationary admissions decisions and help identify candidates who might benefit from additional instructional assistance. In the past, these students may have been denied entrance to, withdrawn, or dismissed from their desired professional programs (Wilmore & McNeil, 2002).

Nursing Education Programs and Success Predictors

The Institute of Medicine (IOM) (National Academy of Sciences, 2008) has predicted that the number of older Americans will double between 2005 and 2030 as the first group of baby boomers turned 65 years old in 2011; the United States, asserted the IOM, will not be prepared to meet the social and health care needs of this retiring demographic (National Academy of Sciences, 2008). For example, the workload of an internal medicine physician is predicted to increase 29% by 2025; for pediatricians and family physicians the increase is anticipated to increase 13% (Colwill, Cultice, & Kruse, 2008). During the same time, the number of adult care generalists is expected to decrease

by 7%, with a potential shortage of between 39,000 – 44,000 providers. In other words, demand for health care providers will increase while the supply is projected to shrink. Similarly, the Council on Graduate Medical Educators has forecasted that the United States will encounter a physician shortage of 10% by 2020 (Goodman & Fisher, 2008). Between now and 2030, schools of medicine in this country will need to train more than 100,000 surgeons to meet predicted demand (Williams, Satiani, Thomas, & Ellison, 2009).

The nursing profession is also facing a future shortage of nurses, By 2020, 36% of nursing positions are anticipated to remain unfilled with a potential shortage of between 400,000 and 808,000 nurses (Keenen, 2003). A number of approaches to address the deficit have been proposed; increasing the size of the workforce is one of several strategies mentioned by experts. However, simply recruiting more nurse candidates into nursing education programs falls short of the objective–in order to practice, the candidates must be able to successfully acquire proper certification as well. Therefore, nurse educators must be able to determine when remediation is appropriate for certain students who might be in danger of failing the nursing licensure examination.

In order to practice as registered nurses, nurse candidates must pass the National Council Licensure Examination for Registered Nurses (NCLEX-RN). For many years and to the present, the nursing profession and its educational researchers have sought to determine academic factors that might predict success of nursing students on the NCLEX-RN and other licensing examinations (Briscoe & Anema, 1999; Hedderick, 2009). For example, Henderson and Orr (1989) analyzed nursing students and their successful completion of the Maine State Board Licensing Examination (SBE). A

prediction model was developed using academic data on 50 students who graduated from 1983 and 1984; a validation group was comprised of 105 students who graduated during the years 1985-1988. Using the SBE score as the dependent variable, the researchers used a number of predictor variables, such as SAT scores, the grades of science, statistics, and nursing theory courses, GPAs, and the results of two standardized tests of nursing content in an attempt to identify predictor variables. Using the Pearson product-moment correlation coefficient, a success prediction model developed by Henderson and Orr was validated by the predictor variables of 105 nursing students. The correlation of the 105 predicted with the actual SBE scores was strong at $r = .75$, $p < .05$. Of the examination failures, 87% were correctly predicted by the model; 56% of the group that had been identified as needing additional instruction subsequently passed the examination. Finally, the authors pointed out that if the prediction model had been used as a screening tool during the student preadmission process, 70% of actual examination failures would have been identified and 62% of the students recognized as needing additional instruction during the preadmission process would have passed their licensing examinations. These results were consistent with what was reflected in the literature at the time of the study (Briscoe & Anema, 1999). Because the research focused on SBE failure, the model's success at predicting an SBE passing score was not revealed in the report (Henderson & Orr, 1989).

Daley, Kirkpatrick, Frazier, Chung, and Moser (2003) conducted a study that examined demographic and academic variables of a convenience sample of 224 nursing students who were in a Bachelor of Science in Nursing degree program. The variables of the students who passed the NCLEX-RN on the first attempt were compared with those

of the students who did not pass the NCLEX-RN on the first attempt. The members of one cohort, which consisted of 121 senior students, were required to take the Mosby Assess Test; the members of the second cohort, which was composed of 103 senior students, were strongly encouraged to take the Health Education Systems Incorporated (HESI) Exit Exam. Both the Mosby test and the HESI examination are computerized, timed evaluations that closely emulate the NCLEX-RN examination and are often used by nursing students as practice for the NCLEX-RN. Demographic variables used in the study included student age, sex, ethnicity, prerequisite course GPA scores and American College Test (ACT) scores. Program variables included a student's earned grade in each of several prerequisite courses, three nursing program courses, and the student's final cumulative GPA. The results of independent *t*-tests and chi-square tests revealed that only two program variables, the final course grade on one particular nursing course and the final cumulative GPA, were significantly correlated with success on the NCLEX-RN. In addition, the predictive value of the HESI examination was found to "…demonstrate greater sensitivity, specificity, positive and negative predictive value, and test efficiency…" to that of the Mosby Assess Test (Daley et al., 2003, p. 390). Earlier studies had concluded this finding as well (Lauchner, Newman, & Britt, 1999; Nibert, Young, & Adamson, 2002). However, Noel (2009), in a recent dissertation, disputed the notion that the HESI Exit Exam was an accurate predictor of success on the NCLEX-RN.

Newton and Moore (2007) evaluated academic records of 120 first year students in a graduate nursing program, attempting to determine whether an applicant's undergraduate GPA (UGPA) was a stronger predictor of program success than GRE scores. Using regression analysis, the researchers concluded that UGPA accurately

predicted GRE scores. The research revealed that if an applicant's UGPA was 3.28 (on a 4.0 scale) or above, it could be used in the place of the GRE as a dependable admission criterion. As a result, the researchers concluded that the GRE could be dropped as an admission requirement if the applicant's UGPA was 3.28 or higher. Eliminating the GRE as an admission requirement, concluded the researchers, may serve to encourage applicants to apply to the graduate nursing program who would have otherwise decided, because of the GRE requirement, not to apply. Enlarging the graduate nursing applicant pool, the researchers theorized, would improve the probability that the most qualified applicants could apply, be accepted, and graduate (Newton & Moore, 2007).

More recent research by Shirrell (2008) evaluated whether the evaluation of critical thinking skills could have predicted student success on a student's first attempt at passing the NCLEX-RN. This study examined a sample comprised of 173 graduates of an Associate Degree in Nursing program, all of whom took the NCLEX-RN. The dependent variable was success in the nursing program, with success defined as having passed the NCLEX-RN. The independent variables were the student's ability to think critically as measured by the Collegiate Assessment of Academic Proficiency critical thinking test score, the student's GPA in nursing courses, and the student's GPA in science courses. Multiple linear regression and Pearson product-moment correlation coefficient analyses were used to evaluate the data. Multiple regression analysis revealed that the model comprised of the variables critical thinking score, nursing course GPA, and science course GPA was predictive of success on the NCLEX-RN ($F = 7.987$, $p < .0001$). Pearson product-moment correlation coefficient analyses showed correlations between critical thinking scores and science course GPA and critical thinking scores and nursing

course GPA were moderate at $r = .314$ and $r = .372$ ($p < .0001$), respectively. Shirrell concluded that critical thinking score alone was not a satisfactory predictor of success on the NCLEX-RN but that a model which consisted of the critical thinking score, and nursing and science course GPAs, was.

Gilmore (2008) conducted a retrospective correlational study of 218 students who had been admitted to two different Associate Degree in Nursing programs. The purpose of the study was to identify predictor variables that could be used during the admission process to forecast the likelihood of success on professional licensure examinations. The dependent variables were the cumulative nursing program GPA of each student and student success on the NCLEX-RN. The independent variables included the student's ACT composite score, ACT reading, math, English, and science subscores, grades in anatomy and physiology I and II courses, and cumulative GPA prior to starting the nursing program. Analysis of variance revealed that the combination of all independent variables was statistically significant as a predictor of cumulative nursing GPA. In addition, regression analysis demonstrated that only the ACT English subscore was statistically significant ($t = 2.307$, $p < .05$) as a nursing program success predictor. The nursing GPA variable was found to be the only predictor of NCLEX-RN success.

Uyehara, Magnussen, Itano, and Zhang (2007) sampled a cohort of 218 students enrolled in a Bachelor of Science in Nursing degree program to determine whether certain pre-admission, within program, or end-of-program factors could predict each student's success on the first attempt taking the NCLEX-RN. The researchers also attempted to determine which of these factors might also predict potential failure. The study results suggested that success on the NCLEX-RN was moderately correlated with a

student's success on the National League for Nursing (NLN) Adult Health Comprehensive Test ($N = 217$, $r = .41$, $p < .0001$), and weakly correlated with NLN Maternal Newborn Comprehensive Test ($N = 217$, $r = .16$, $p = .0179$), Mosby Assess Test ($N = 216$, $r = .24$, $p = .00003$), and the NLN Pediatric Nursing Comprehensive Test ($N = 216$, $r = .20$. $p = .0025$). In addition, nursing GPA ($N = 217$, $r = .186$, $p = .0059$) and course grade in Fundamentals of Nursing ($N = 217$, $r = .195$, $p = .0038$) were also weakly correlated with success on the NCLEX-RN. The only independent variable that was a significant predictor of program withdrawal was the grade on the pathophysiology course ($N = 271$, $p < .0001$) (Uyehara, Magnussen, Itano, & Zhang, 2007).

Allied Health Sciences Education Programs and Success Predictors

As with the nursing profession, members of most allied health professions serve as direct patient care providers and similarly require licensure. Examples of allied health professions include occupational, respiratory, and physical therapies, medical laboratory specialties, nuclear medicine and radiological therapies, physician assistant, and health information administration. Like nursing educators, allied health professions educators have also attempted to identify predictors of success.

The physical therapy profession, for example, has been particularly diligent in its search for indicators of success. For instance, Dockter's (2001) often-referenced retrospective study used a convenience sample of the academic records of 107 physical therapy students. The independent variables were several preadmission criteria; the dependent variables were student GPA at the end of the first year and student scores on the National Physical Therapy Examination (NPTE). The independent variables were correlated with the dependent variables; significant correlations were then entered into a

stepwise linear regression analysis to obtain the best predictors. Results suggested that the preadmission variables of core course GPA, total admission points, and admission age were moderately correlated with academic success in the first year while the best predictor of academic success in the first year was total admission points plus age on admission ($N = 107$, $r = .439$, $p < .01$). The predictor variable of total admission points was based on a formula composed of preadmission GPA, verbal interview score, and writing sample score. In addition, core course GPA was moderately correlated with success on the NPTE ($N = 43$, $r = .341$, $p < .05$). The best predictor of NPTE success, however, was the strong correlation with GPA at the end of the first year of the program ($N = 43$, $r = .648$, $p < .01$). Similarly, Kosmahl's 2005 retrospective study of a convenience sample of 92 alumni of a professional Master of Physical Therapy program revealed that the program's comprehensive exam score ($r = .617$, $p < .001$) and professional GPA ($r = .604$, $p < .001$) were strongly correlated with the score on the NPTE.

A 2005 study by Mohr, Ingram, Hayes, and Du examined 21 independent variables to determine whether any of them played a role in predicting the graduate pass rate of an accredited physical therapy program. Surveys were sent to program directors of 175 accredited physical therapy programs, 132 of which were returned for further examination. Regression analysis results revealed that the program pass rate was dependent on a number of factors including whether the program was accredited or in probationary status, number of faculty with a PhD or EdD, and years of combined student preprofessional and professional coursework. Similarly, in a retrospective study, Hollman, et al. (2008) investigated whether a series of cognitive preadmission variables

and the results of a behavioral interview could predict an individual's success on the NPTE. Data from a convenience sample of 141 students suggested that two variables, performance on the verbal subscale of the GRE and performance on a behavioral interview, were statistically significant in predicting success on the examination.

Educators of other allied health disciplines have also searched for predictors of success. In a 2007 study using a convenience sample of 373 pharmacy school students, McCall, MacLaughlin, Fike, and Ruiz examined whether prepharmacy variables could predict graduate success on the North American Pharmacist Licensure Examination (NAPLEX) test. Nominal variables were analyzed with a chi-square test, while continuous data were analyzed with independent-sample *t*-tests. Correlations were also calculated to test the strength and direction of the relationships between variables. Prepharmacy school GPA and California Critical Thinking Skills Test score were each weakly correlated with the NAPLEX score ($r = .207$ and .200 respectively; $p < .001$ for each). The best predictor of success on the NAPLEX, however, was the moderately correlated composite PCAT score ($r = .400$, $p < .001$). In addition, stepwise regression analysis that applied all prepharmacy variables except PCAT subscores affirmed a correlation between several predictor variables and NAPLEX score at $p < .001$ level of significance.

Hulse et al. (2007) assessed whether cognitive and non-cognitive factors could predict student success in the United States Army Graduate Program in Anesthesia Nursing. This study, which included 42 students, employed logistic regression analysis; only two non-cognitive factors were found to be correlated with program success: locus of control, which demonstrated a weak positive correlation ($r = .240$, $p < .05$) and trait

anxiety, which expressed a weak negative correlation (r = -.240, p < .05). The authors concluded that non-cognitive factors may be as critical as cognitive factors in forecasting academic success in the military graduate anesthesia program.

Health Information Administration and Success Predictors

Similar to other allied health professions, graduates of accredited health information administration (HIA) programs are expected to pass a certification examination. Health information administration is a profession that is not as familiar as other allied health disciplines. Health information administrators collect, validate, manipulate, store, provide, and protect data generated during the provision of health care. These data are used by administrators, health care providers, patients, and many other entities in support of patient care. Health information administrators, unlike most allied health professions, do not engage in direct patient care.

Although not as well-known as other health care professions, health information administration, as a formally recognized discipline, has been present for over 80 years. Throughout the first three decades of the twentieth century, the processes and tasks associated with maintaining patient health information began to take on a professional standing (Huffman, 1994). In 1932, the American Health Information Management Association established minimum qualifications, including a written examination, by which practitioners could be recognized as professionals in the HIA field. The standards have been advanced over the years just as standards in all of the allied health professions have been continuously updated and improved. The Registered Health Information Administrator (RHIA) certification examination evaluates entry-level knowledge of individuals who have graduated from accredited HIA programs. The RHIA certification

is a professional credential that many employers expect an applicant to have earned when considering an HIA professional for a position.

One of the forces driving the increased need for and heightened awareness of health information administrators is the massive push underway by the federal government to adopt and implement electronic health records (EHR); credentialed health information administrators are familiar with and possess the skill sets required to successfully integrate the EHR technology (Viola, 2008). However, because of the aging HIA workforce, and too few HIA academic programs graduating an insufficient number of HIA graduates, the number of HIA professionals available to carry out the EHR transformation will fall well short of the number needed ("Take Action," 2009).

Nationally, the first-time pass rate on the RHIA certification examination is 74% (American Health Information Management Association, 2011c). Candidates who fail the examination are eligible to re-take it as often as they would like. However, unlike most health care professions, possession of the RHIA certification is not required for one to practice professionally in health information administration; because of this, the motivation for a graduate to take the RHIA examination immediately upon graduation may not be as potent as if possession of the certification was mandatory. Investigating this phenomenon, studies have produced mixed results as to whether an extended amount of time between graduation and taking a profession's certification examination affected the candidate's success on it. For example, in 2003, a pilot study by Beeman and Waterhouse evaluated post-graduate influences on the NCLEX-RN. Results of the study revealed that the number of weeks that elapsed between the day of graduation and the day of taking the examination was not significantly correlated with passing it. On the other

hand, Woo, Wendt, and Liu (2009) examined over 244,000 NCLEX results, taken by both registered nursing and practical nursing candidates. They found that the number of days between graduation and taking the examination was inversely related to the examination pass rate.

Condon and Barefield (2010) assessed the scores of 59 graduates of an accredited health information administration program to determine whether the number of days between graduation and the first time taking the RHIA certification examination influenced the pass rate of program graduates. Pearson product-moment correlation coefficient calculations revealed only a weak correlation ($r = .20$, $p < .05$). The results suggested that for this particular population, the length of time between graduation and the day of the certification examination was only weakly correlated with less successful outcomes.

Health information administration programs are evaluated and accredited by the Council on the Accreditation of Health Informatics and Information Management Education (CAHIIM). Only graduates of professional programs accredited by CAHIIM are eligible to take the RHIA certification examination. Smith (2006) noted that in 2005, CAHIIM's accreditation standards shifted to an outcomes-based assessment process in which an HIA program's accreditation is directly connected to student learning outcomes. One such outcome that is examined annually is the percentage of first-time RHIA examination takers who achieved a passing score in the previous academic year. In light of this critical benchmark, leaders of HIA education programs would benefit from an evaluation tool that might predict whether a student is likely to pass or fail the certification examination on the first attempt so that, if necessary, appropriate

interventions or remediation may be initiated before the graduate takes the examination. A thorough review of the literature, including the profession's body of knowledge, revealed the existence of only one study that focused exclusively on identifying predictors of RHIA certification examination success.

McNeill and Brockmeier (2005) analyzed information obtained from 33 of the 46 accredited HIA programs in an effort to investigate the relationships and influence of selected HIA program components and each program's percentage of graduates who passed the RHIA certification examination on the first attempt. Pearson product-moment correlation coefficient computations yielded a moderate positive correlation ($r = .49$, $p = .04$) between an HIA program's graduate pass rate on the examination and total program expenditures. In this study, expenditures were defined as the program's final annual budget in dollars. In addition, a strong positive correlation ($r = .53$, $p = .02$) was also found between an HIA program's graduate pass rate and the mean admission GPA of students, and a moderate negative correlation ($r = -.45$, $p = .04$) was identified between program success rate and student to faculty ratio. These correlations were identified only in one year of the two years under study; the second year under study exhibited no significant correlations. A regression model did not significantly predict a program's percentage of graduates passing the RHIA certification examination (McNeill & Brockmeier, 2005). The researchers concluded that, contrary to what they had expected, fewer moderate to strong correlations existed between the HIA program's percentage of successful first time RHIA certification examination takers and program components. The researchers had expected to find a larger number of significant relationships and differences. Few individual student demographic and academic attributes, however, were

examined during the course of the study. Recognizing that this area of the profession's knowledge base was limited and under-researched, the authors recommended further studies using more student-focused variables (McNeill & Brockmeier, 2005).

Non-Cognitive Success Indicators

In 1993, Messick described cognitive factors as synthesized methods of thinking, perceiving, recalling, decision making, and problem solving that represent the normal function of information processing. Cognitive factors, such as high school class rankings, various grade point averages, SAT and ACT results, and course grades, have been demonstrated as superior to non-cognitive factors when used as success predictors (Adebayo, 2008; Giddens & Gloeckner, 2005; Guffey, Farris, Aldridge, & Thomas, 2002; Mattson, 2007). Studies have examined the usefulness of various non-cognitive factors in predicting academic success such as the Non-Cognitive Questionnaire (Schauer, Osho, & Lanham, 2011); Life Stressors, Learning Style, and Social Interaction scores (Helms, 2008); personal interviews, letters of reference, personal statements, personality testing, and emotional quotient/emotional intelligence examinations (Siu & Reiter, 2009); and academic positive self-concept, realistic self-appraisal, support of academic plans, and leadership (Maring & Costello, 2009). Few of these studies revealed non-cognitive variables as accurate predictors of success.

As a result of the review of the literature, a conscious decision was made to not investigate non-cognitive factors, except for several demographic variables.

Demographic Variables of Study Participants

Gall, Gall, and Borg (2003) defined a variable as "…a quantitative expression of a construct" (p. 7). Demographic variables represent characteristics of a population and include such aspects as age, race, income, sex, religion, occupation, and social class.

Informed by a review of the literature, the following demographic variables have been included in research methodology for previous similar studies:

Race and Ethnicity

Several studies suggested that non-White students were at greater risk of failing professional examinations. Research by Haas, Nugent, and Rule (2004) concluded that African-American students were more likely to fail the NCLEX-RN. Similarly, Sayles, Shelton, and Powell (2003) found that students from underrepresented ethnicities were less likely to pass the NCLEX-RN than their White classmates. These findings support the results of several earlier investigations (e.g., Agho, Mosley, & Williams, 1999; Chapman, 1989; Scott et al., 1995) in which ethnicity significantly predicted academic difficulty.

Mother Tongue

In a 1998 study by Arathuzik and Aber, a "…significant, although low…" (p. 124) correlation was found between English as a student's primary language spoken at home and success on the NCLEX-RN ($r = .253$, $p = .05$). Zwick and Sklar (2005) suggested that a student's language background should be taken into account when conducting educational research. Indeed, it is not unusual for students for whom English is not a first language to be diagnosed as learning disabled after completing an IQ test (Gunderson & Siegel, 2001). It is possible, then, that a student's language status could

affect his or her success on a comprehensive professional certification examination, such as the RHIA examination.

Age

In several previous studies, the age of the student was found to be a demographic success indicator. For example, a meta-analysis of research in the nursing profession which examined indicators of success found that age was significantly correlated with success on the NCLEX (Campbell & Dickson, 1996). Schofield and Dismore (2010) studied retention and achievement of students in higher education settings and discovered that older students were more likely to complete the course and earn a higher grade than younger students. In a recent dissertation, Humphreys (2008) concluded that the student's age at the time of taking the NCLEX-RN examination predicted future success.

Academic Variables of Study Participants

Academic variables, as demographic variables, represent characteristics of a population. Examples of such variables include grade point averages, high school graduation rankings, examination scores, course grades, and admission test scores.

The review of the literature suggested that the following demographic variables have been included in research methodology for previous similar studies:

Standardized Admissions Tests

Standardized admissions tests, such as the SAT, have been criticized for being culturally biased and, therefore, not necessarily truly reflective of a student's academic ability or potential for future success (Hossler & Kalsbeek, 2009; Laundra & Sutton, 2008). These examinations primarily affected African-Americans negatively, perhaps unfairly assigning lower scores. In fact, Marbley, Bonner, and Berg (2008), in their

research examining measurement and assessment of people of color, noted the "…emphatic words of one [study] participant, 'Culture incongruence' [as] the one single factor that can adversely affect the success of students of color" (p. 16). In his 1992 review of the literature, Jenkins had already recognized this quandary and, almost prophetically, proposed that the use of SAT results for predicting academic success at Canadian post-secondary technical institutions "…should only be used cautiously in predicting academic success" (p. 8). Specifically, Jenkins highlighted the conclusions of several research studies, all of which suggested that cultural, socioeconomic, and gender biases were inherent in the SAT. He further advocated that SAT results be used only to supplement high school GPA when assessing potential scholastic success.

Currently, a spirited debate is taking place on the pages of the *Harvard Educational Review* as both critics and defenders of the SAT engage on the topic of cultural bias ("Bias in the SAT?," 2010; Santelices & Wilson, 2010). Over the past few years, more and more people have criticized the SAT for creating an obstacle to higher education access and, as of 2009, more than 30 of the *U.S. News & World Report* Top 100 Liberal Arts Colleges have initiated some form of an SAT-optional admissions policy (Epstein, 2009). Hopkins (2008) has suggested that aptitude tests, such as the SAT, should be deemphasized because student achievement examinations more accurately predict success. Murray (2007) argued that the SAT is a negative force in American life and has proposed eliminating it altogether.

Various permutations of a student's grade point average most accurately predicted student success while the SAT and ACT were either weakly or not predictive at all (Gilmore, 2008; Helms, 2008; Kosmahl, 2005; Schauer, Osho, & Lanham, 2011).

Clearly, there was no consensus as to the utility of the SAT and, in light of information gathered during the literature review process, the collection of SAT and ACT scores were not included as a part of this study.

Grade Point Averages

By far, the academic variable found most often to be correlated with a successful outcome was grade point average. Many different variations of GPA were analyzed; for example, one study considered GPA after the first year of professional courses (Dockter, 2001); two studies examined high school GPA (Adebayo, 2008; Platt, Turocy, & McGlumphy, 2001); several evaluated undergraduate program GPA (Arathuzik & Aber, 1998; McKee, Mallory, & Campbell, 2001; Newton & Moore, 2007); and several more investigated cumulative college GPA (Grove, Wasserman, & Grodner, 2006; Reisig & DeJong, 2005; Schmidt, Homeyer, & Walker, 2009). Still other studies reported on cumulative professional GPA (Gilmore, 2008; Kosmahl, 2005; Payne & Duffy, 1986; Shirrell, 2008; Uyehara, Magnussen, Itano, & Zhang, 2007) and on preprofessional GPA (McCall, MacLaughlin, Fike, & Ruiz, 2007).

Success on Professional Courses

Several previous studies have investigated whether the results of certain pre-professional and professional courses completed by students might be beneficial to predicting success. Henderson and Orr (1989) found that a lower-level biology course and a professional course, Applied Concepts of Health and Illness, increased the prediction accuracy for state nursing board examination scores. Similarly, Daley, Kirkpatrick, Frazier, Chung, and Moser (2003) reported that the final grade for a clinical medical-surgical nursing course was found to be significantly correlated with success on

the NCLEX-RN. Other research (Shirrell, 2008; Uyehara, Magnussen, Itano, & Zhang, 2007) has shown similar correlations.

In a study examining success predictors in a pharmacy professional program, Houglum, Aparasu, and Delfinis (2005) discovered that similar variables can also be used to predict failure; the average grade in the program's organic chemistry course predicted both success and failure. The researchers recommended that both sets of such variables should be used as screening criteria.

Remediation of Students Identified as At-Risk

The benefits of identifying at-risk students for additional instruction or other remediation has also been studied by researchers from the nursing profession; however, a systematic review of the research assessing the degree of effectiveness of various interventions found that the quality of the studies were "…uneven but generally low" (Pennington & Spurlock, 2010, p. 485) and limited in their ability to pinpoint specific interventions that were successful (DiBartolo & Seldomridge, 2005). According to Pennington and Spurlock (2010), one of the highest quality studies that they reviewed, albeit outdated, was by Ashley and O'Neil (1991), who examined two groups of at-risk nursing students; in a higher education context, the researchers defined an "at-risk" student as one with a GPA of 2.40 or below, a ranking on the Mosby Assess Test at or below the 20th percentile, or diagnosed with a learning disability. One of the at-risk groups, composed of fourteen students, received an intervention of a "test-coaching" approach to NCLEX preparation. The approach focused on the acquisition of nursing knowledge and the improvement of test-taking skills. The second group, which consisted of sixteen students, received no intervention and was considered the control group.

For the group that received the intervention, the NCLEX-RN passing rate was 92.9%; the control group's passing rate was 50% (Ashley & O'Neil, 1991). The study results suggested that timely intervention can positively influence students who have been identified as having a greater risk of not passing a licensure or certification examination. A related issue investigated by researchers sought to establish the most appropriate point in the curriculum when the identification of at-risk students should take place.

In 1989, Jenks, Selekman, Bross, and Paquet conducted a study in which previous nursing research was evaluated and the most accurate predictors of success were identified. The purpose of the study was to determine when the most relevant time was during the curriculum to identify at-risk students so that remediation could be initiated. Based on an earlier study by Payne and Duffy (1986), Jenks et al. recognized three general observations regarding the appropriate time to recognize at-risk students: 1) the final semester of a program was the point at which the most accurate predictions of at-risk students could be made, but was also too late to initiate remediation; 2) the start of a program was the point where remediation could be offered without a time constraint, but the success predictors were not strong or accurate enough to identify students who would be at-risk; and 3) the optimal point in time at which an accurate prediction could be made and where enough time remained to offer remediation was after the first semester of the program.

The results of the study revealed that at-risk students should be identified prior to the start of the senior year of the program because this is the point at which the predictor variables are accurate enough to identify these students, yet where sufficient time remains

in the program to initiate appropriate remediation (Jenks et al., 1989). In the introduction of their manuscript, the authors commented on the objective regarding their study findings:

> The ultimate goal is not to discriminate, either at entry into nursing or throughout the course of study, but rather identify the high-risk student, allowing for early intervention, and to potentially decrease the cost of education, in both dollars and time, for the student. (p. 112)

It should be likewise noted that the intent of this study was not to identify success predictors to be used during the screening or application process. Rather, this study's purpose was to find and provide information for employment by educational leaders after a student's matriculation into a program, identical to the spirit of the explanation of the ultimate goal in the research conducted by Jenks et al. (1989).

Summary of the Review of the Literature

Based on a review of literature, several research studies have generated prediction models that use programmatic and student demographic and academic variables to predict success on professional licensure or certification examinations. According to the results of each study, the predictors were surprisingly accurate in identifying students and graduates who had higher likelihoods of successfully completing certification examinations. Although many variables have been tested, a handful of them are consistently more accurate than others.

Upon close inspection of the health information administration profession's body of knowledge, only one peer-reviewed research study examining this topic has been conducted. The results of the study found no statistically significant predictor variable.

Therefore, a knowledge gap clearly existed regarding the potential use of student demographic and academic variables to predict success on the Registered Health Information Administrator certification examination. Establishing predictors of success will enhance the ability of higher education leaders to improve their programs' first-time pass rates on the Registered Health Information Administrator certification examination. Increased pass rates will, in turn, help maintain program accreditation, increase the number of certified health informaticians in professional practice, and promote the delivery of quality health care in the United States.

CHAPTER III

METHODS

The purpose of this chapter is to describe the methodology that was used to answer the overarching research question: What differences, if any, exist among candidates for the Registered Health Information Administrator certification examination that may characterize the likelihood of acquiring professional certification?

The following subquestions were investigated to answer the overarching research question:

1. Which individual student demographic variables correlate with a passing score on the Registered Health Information Administrator examination?
2. Which individual student academic variables correlate with a passing score on the Registered Health Information Administrator examination?
3. Can a Registered Health Information Administrator examination success prediction model be identified?

Research Design and Methodology

The study used a quantitative approach. The method employed was a correlational design using a convenience sample. Variables were tested to ascertain correlation; they were also analyzed to define which may most accurately predict an outcome. In such scenarios, the quantitative approach is appropriate (Creswell, 2009). A review of the literature established that similar research studies have also used the quantitative approach and a correlational design. Although Sprinthall (2002) cautioned that correlation cannot be used to assign causation, he suggested that it permits the researcher

to make "…better-than-chance predictions" and, sometimes, to point "…a finger of suspicion in the direction of possible causation" (p. 389).

Sample

Sample data used in the study were obtained from the educational records of graduates of accredited health information administration (HIA) educational programs from colleges and universities located in the United States, who graduated between January 1, 2001, and December 31, 2010, and who had taken the Registered Health Information Administrator (RHIA) certification examination. The directors of all accredited HIA programs were invited to provide data for this study.

Sampling Procedure

A convenience sample of records of program graduates was obtained from which certain academic and demographic variables were identified and used for further analysis. A convenience sample, as defined by Gall, Gall, and Borg (2003), is a collection of cases that are selected for statistical analysis because they can be retrieved with few obstacles and because access to them is typically less impeded. The sample data tested in this study were obtained from the academic and demographic records of graduates from Bachelor of Science degree in health information administration and post-baccalaureate certificate in health information administration programs. However, the data sample was limited to graduates who took the RHIA examination between January 1, 2001, and December 31, 2010, and for whom scores could be procured from the American Health Information Management Association. The directors of all HIA programs in the United States were asked to provide de-identified data from eligible graduate records.

Sample Size

When planning research, one of the most critical steps is determining the sample size. If the sample is too small, the precision necessary to provide reliable solutions to research questions is compromised; conversely, if the sample is too large, time and resources necessary to generate such a sample may be wasted, often for minimal gain (Chuan, 2006). Power analysis is used to establish desired sample size.

According to Cohen (1992), four variables exist that comprise statistical inference: sample size, the significance criterion, population effect size, and statistical power. Cohen's statistical power analysis enhances research planning by returning appropriate sample size when given the significance criterion, power, and effect size. In the social sciences, the level of significance (α) is usually set at 0.05, power (β) at .80; and effect size (ES) at medium (Lani, 2008). Power analysis can be used to determine sample size for both the Pearson product-moment correlation and multiple linear regression analysis (Chuan, 2006).

For this study, using power analysis, and with the power analysis variables set at $\alpha = .05$, $\beta = .80$, and ES = .30 (medium), the appropriate sample size for the Pearson product-moment correlation coefficient was 80. The appropriate sample size for multiple linear regression, with the power analysis variables set at $\alpha = .05$, $\beta = .80$, and ES = .15 (medium), and with ten independent variables, was 118 (Soper, 2011). As a result, the sample size for this portion of the study was 118. In addition, to test the predictive validity of the regression model developed, a separate sample of 80 records was collected and analyzed (J. Dias, personal communication, September 11, 2011). The number of records required for this study was 198. Both continuous and categorical variables can be

used in multiple linear regression models; categorical variables, however, in order to fit the model, were expressed by numbers (Jacobsen, 2012).

Instrumentation

The data collection instrument was a simple form, designed exclusively for this study, onto which data elements to be analyzed were recorded (Appendix A). The data collection instrument was used only as a transfer medium. A draft data collection instrument was submitted to and reviewed by the Georgia Southern University Institutional Review Board and the Georgia Health Sciences University's Human Assurance Committee. The instrument was slightly modified as a result of reviewer comments.

Program Setting

For the proposed study, the universities at which the health information administration programs are located were either state- or privately-supported liberal arts colleges or universities, or state- or privately-supported academic medical centers. The programs were typically housed within a department which was a subordinate unit of a School or College of Health Sciences. As a condition of professional program accreditation, the HIA program must be housed within a college or university that is accredited by one of the regional bodies for the accreditation of degree-granting higher education institutions (Commission on the Accreditation for Health Informatics and Information Management Education, 2011). All of the HIA programs that were invited to participate in the study were accredited by the Commission on the Accreditation for Health Informatics and Information Management Education (CAHIIM) and, therefore,

belong to institutions that were accredited by one of the regional bodies for the accreditation of degree-granting higher education institutions.

One of several academic models used for Bachelor of Science degree in health information administration (HIA) programs was a "2 + 2" model. In general, a student who was interested in applying to an HIA program must have first completed sixty semester hours (two academic years) of pre-requisite lower-level courses. The courses to be completed were specified by each HIA program and were often referred to as the core curriculum. Once the student had completed the core curriculum, he or she applied to the HIA program; upon transcript evaluation by the institution's office of academic admissions and HIA program admissions committee, the courses were approved to be transferred in and the student began the HIA program admission process.

If the student was accepted into the HIA program, his or her HIA academic journey began as a junior. Upon successful completion of the professional curriculum, composed exclusively of HIA courses, the student was conferred a Bachelor of Science degree in Health Information Administration. Possession of this degree qualified the new graduate to take the RHIA certification examination.

Several programs also offered a post-baccalaureate certificate in health information administration to graduates with certain bachelors or masters degrees. Although the lengths of the post-baccalaureate certificate programs differed, each program must have adhered to the HIA academic program accrediting agency's standards regarding the requirement to teach and test basic entry-level competencies. Depending on an applicant's academic background, a number of core curriculum courses may have been completed before the applicant was eligible to start the program; exactly which

courses were required was determined by the program's core curriculum requirements and examination of the applicant's post-secondary education transcripts. Upon successful completion of the program, a post-baccalaureate certificate in health information administration was conferred to the graduate and, as with the Bachelor of Science degree in health information administration program graduate, he or she became eligible to take the RHIA certification examination.

Materials and Procedure

After having acquiring permission from the Institutional Review Board at Georgia Southern University and the Human Assurance Committee at Georgia Health Sciences University, an invitation to participate in the study was sent to the program director of each accredited HIA program. The invitation explained the purpose of the study, defined the data elements that were being requested, and described the data submission procedure. Approval documents from the Institutional Review Board at Georgia Southern University and the Human Assurance Committee at Georgia Health Sciences University were made available to each invitee. The Institution Review Board approvals are in Appendix B and Appendix C.

Data Collection

Gall, Gall, and Borg (2003) stated that discovering an important research finding is more likely if the researcher uses the results of previous studies to select variables that are likely to correlate with one another. The variables selected for this study were chosen on the basis of a thorough literature review of similar studies completed in other health-related professions.

The dependent variable was the graduate's raw score on his or her first attempt at taking the RHIA examination and was collected for each participant. The minimum raw score was 0 and the maximum raw score was 160. The raw scores were provided to each program director in quarterly RHIA examination reports sent by the American Health Information Management Association (AHIMA).

Registered Health Information Administrator (RHIA) examination.

The RHIA examination is sponsored by the American Health Information Management Association (AHIMA), the professional association of over 63,000 health information administration (HIA) professionals (American Health Information Management Association, 2011a). Since 1933, AHIMA has been the responsible entity for certifying HIA industry professionals; it is also the sponsor of several other professional certifications in the HIA profession. All AHIMA certification examinations voluntarily comply with *"The Standards for Educational and Psychological Testing (1999 version)"* (American Health Information Management Association, 2011d). The independent agency that was under contract to AHIMA to help develop, administer, and score these certifying examinations was Thomson Prometric.

The process by which Thomson Prometric designed and maintained professional certifying examinations was multi-stepped. First, a thorough job analysis was provided to Thomson Prometric with key responsibilities and competencies identified by the contracting entity. Test items were developed by contracting entity professionals in accordance with specified competencies and appropriate taxonomy levels. Considering the test items and assigned taxonomies, Thomson Prometric created a blueprint for the examination; once constructed, the examination was beta tested to a selected audience.

The results of the beta test determined whether refinements were required. A final version of the examination was administered in several formats to candidates in a live testing environment. Ongoing psychometric analysis ensured that examination design objectives, market requirements, and legal standards were attained. These goals were achieved through results analysis which included fairness assessments, reliability and validity examinations, and performance irregularity reviews (Prometric, 2011). In determining passing scores, Thomson Prometric employed the modified Angoff procedure and Borderline Group method. Specialized techniques used by the company included Rasch/Item Response Theory modeling, standard setting, criterion validity, simulation studies, and detection of differential item functioning and item parameter drift (DIF/DRIFT) studies (Prometric, 2011).

AHIMA's Examination Construction Committee adhered to previously established guidelines when it selected multiple-choice questions used on each examination version to make certain that all versions were equivalent. If the examination fluctuated in its difficulty, the passing score may have changed in a given year. The RHIA certification examination consisted of 180 questions, 20 of which were pretest items and 160 of which were scored items. The examination was computer-administered and lasted four hours (Russell, 2006).

The version of the RHIA examination that was administered to the graduates in the study sample was introduced in 2001. From January 1, 2001, through September 30, 2005, the passing score on the examination was 102 out of 160 scored items; from October 1, 2005, through December 31, 2010, the passing score was 103 out of 160 scored items. The methodology used to set the minimum passing score was the modified

Angoff procedure. As a widely-accepted psychometric procedure, the Angoff used content experts to approximate the probability of passing each item on the RHIA certification examination (American Health Information Management Association, 2006).

The ten independent variables obtained from each graduate's academic record and provided for research analysis included the following data items:

Race.

This data element, a nominal variable, was composed of the categories established by the United States Census Bureau; categories included "White alone," "Black or African American alone," "American Indian or Alaska Native alone," "Asian alone," Native Hawaiian or Pacific Islander alone," "some other race alone," and "two or more races."

Ethnicity.

Ethnicity of the graduate, a nominal variable, is a category established by the United States Census Bureau. The two categories for this variable included "Hispanic" and "non-Hispanic."

Mother tongue.

This data element, a nominal variable, was composed of the categories "English" and "non-English."

Final letter grades on specified professional courses.

These four data elements were composed of the final letter grades on the Medical Terminology, Pathophysiology and Essentials of Pharmacology, Introduction to Health Information Management, and Health Data Classifications and Coding Systems (ICD-9-

CM) courses. They were ordinal variables and were represented by the categories A, B, C, D, and F.

Age on the first day.

The graduate's age on the first day of the health information administration program comprised this data element; it was an interval variable, stated in years.

Professional curriculum grade point average.

This data element was a ratio variable and represented the grade point average of only health information administration professional courses; it was derived from a 0 – 4.00 grading scheme. It was reported rounded to two decimal places.

Core curriculum grade point average.

This data element was a ratio variable and represented the grade point average of core curriculum or program pre-requisite courses. These courses typically included but were not limited to English, algebra, the humanities and fine arts, natural sciences, social sciences, and technology courses; it was derived from a 0 – 4.00 grading scheme. It was also reported rounded to two decimal places.

Data Collection from Each Program

The records that comprised the sample were obtained from the directors of health information administration programs who had agreed to provide graduate demographic and academic data. Prior to the data being provided, program directors ensured that all personally-identifying information had been omitted. An "honest broker" system of record submission was used whereby a trusted third person, not affiliated with the research, collected all submitted de-identified data from program directors. The honest broker further de-identified the data by removing program identifying information from

the submitted records. The honest broker then assigned a "pseudo-number" to each record before making the data available for analysis. This process insured that the only individual who could link an individual record with a specific HIA program was the honest broker; it was not known to whom the record belonged and, with the exception of the honest broker, from which program the record was provided.

Once the de-identified records were received from the honest broker, each was numbered sequentially starting with the number 001. The Excel spreadsheet random number application was used to randomly select records for inclusion into one of two sample groups: Group one, which consisted of 118 randomly selected records; and group two, which consisted of the remaining 80 records. Pearson product-moment correlation calculations and multiple regression analysis were computed on the records in group one. The records in group two served to validate the success prediction model.

Data Analysis

SPSS (formerly called the Statistical Package for the Social Sciences) and Microsoft Excel 2010 spreadsheet application were used to conduct all statistical computations. The de-identified data were used to calculate descriptive statistics, including mean academic and demographic characteristics of the graduate sample. Pearson product-moment correlation coefficient computations were used to establish strengths of the relationships among the data variables obtained from the graduates' records; consequently, subquestions one and two were addressed.

Multiple linear regression was employed in an attempt to build and assess a prediction model that will forecast a graduate's RHIA certification examination score. In addition, a prediction interval was established for the raw scores. Considering the values

of independent variables, a prediction interval is fundamentally a confidence interval for the predicted value of an individual response. The Approximate 95% Prediction Interval was derived from the Approximate Margin of Error; this value was computed by multiplying the *t*-value (.05,*df*) (referred to in the Excel application as $t_{inv)}$ by the Approximate Standard Error of the Prediction. Upper and lower bounds were added to the prediction model. As a result, research question three was answered.

Reporting the Data

The results of the proposed study were analyzed and will be disseminated through the profession's peer-reviewed journals. In addition, the results will be presented at professional association education symposia, such as the Assembly on Education annual meeting.

Chapter Summary

The proposed study's objective was to ascertain whether differences existed among candidates for the Registered Health Information Administrator certification examination that may characterize the likelihood of acquiring professional certification. The proposed study was correlational and employed the Pearson product-moment correlation coefficient to answer research subquestions one and two; multiple linear regression was computed to answer research subquestion three.

The sample for the proposed study consisted of the records of graduates from accredited Bachelor of Science degree and post-baccalaureate certificate in health information administration programs located in the United States. De-identified records of graduates were provided by the directors of the programs. Sample records must have affirmed that the graduate attempted the certification examination between January 1,

2001, and December 31, 2010. The sample size for the proposed study was 198 records, 118 of which were used to complete the statistical computations; the remaining 80 were employed to test the success prediction equation.

The dependent variable was the graduate's raw score on the first attempt at taking the Registered Health Information Administrator certification examination. There were ten independent variables including race and ethnicity, mother tongue, grades on four specified professional courses, two different grade point averages, and age at which each graduate started the program. A data collection instrument was employed to collect items from each record; these data were manually entered into SPSS and Microsoft Excel for further analysis.

CHAPTER IV

REPORT OF DATA AND DATA ANALYSIS

The purpose of this study was to investigate whether success predictors for students and graduates of accredited health information administration academic programs can be identified. These success predictors might then be applied to enhance the passing rates of graduates on the Registered Health Information Administrator certification examination.

A series of academic and demographic variables of former students who graduated from accredited health information administration academic programs was collected on which statistical analyses were conducted. Descriptive and inferential statistics were computed in order to identify correlations among the variables and to establish a success prediction model.

Research Questions

This study addressed the following overarching research question: What differences, if any, exist among candidates for the Registered Health Information Administrator certification examination that may characterize the likelihood of acquiring professional certification?

The following subquestions were investigated to answer the overarching research question:

1. Which individual student demographic variables correlate with a passing score on the Registered Health Information Administrator examination?
2. Which individual student academic variables correlate with a passing score on the Registered Health Information Administrator examination?

3. Can a Registered Health Information Administrator examination success prediction model be identified?

Research Design

The researcher employed a correlational research design. Preexisting data of graduates who had successfully completed degrees from accredited health information administration programs and who had taken the Registered Health Information Administrator (RHIA) certification examination were evaluated to determine whether academic or demographic differences existed that might suggest a proclivity to achieve a higher score on the certification examination. The independent variables included race, ethnicity, mother tongue, age at the start of the program, final grades on four professional courses, core curriculum grade point average, and professional curriculum grade point average. The dependent variable was the raw score on the RHIA certification examination. Pearson product-moment correlation was computed to establish associations between the independent and dependent variables. Multiple linear regression was employed to establish an RHIA certification examination success prediction model. The model then was tested using an independent sub-sample of graduate data.

Demographic Profile of the Respondents

The data that were used in this study were provided by the program directors of accredited health information administration academic programs, which included approximately fifty programs; all of the programs were located in the United States. Specifically, the data represented characteristics of these programs' former students who graduated and took the RHIA certification examination during the years 2001 through 2010. The dependent variable, the RHIA certification examination raw score, was

provided only for the graduate's first attempt on the certification examination. A total of 198 graduate records were collected for this study; 118 were randomly selected from this total. This first sub-sample served as the data set on which descriptive and inferential statistics were computed. The remaining 80 graduate records were used to validate the potential prediction model. Graduate demographic and academic data are provided in Tables 1 through 4.

Table 1

Frequency Distribution for Age at Start of the Program

Variable in Years	*n*	Percentage	Cumulative Percentage
16-20	11	9.3	9.3
21-25	41	34.7	44.0
26-30	20	16.9	60.9
31-35	16	13.6	74.5
36-40	12	10.2	84.7
41-45	7	5.9	90.6
46-50	8	6.8	97.4
51-55	2	1.7	99.1
56-60	1	.9	100.0
Total	118		

Table 2

Frequency Distribution and Sample Percentages for Race, Ethnicity, and Mother Tongue

Variable ($N = 118$)	*n*	Percentage of Sample
Race		
White only	67	56.8
Black or African American only	40	33.9
American Indian or Alaska Native alone	0	0.0
Asian Alone	5	4.2
Native Hawaiian or Pacific Islander alone	2	1.7
Some other race alone	2	1.7
Two or more races	2	1.7
Ethnicity		
Non-Hispanic	110	93.2
Hispanic	8	6.8
Mother Tongue		
English	104	88.1
Non-English	14	11.9

Note: Race and ethnicity categories are those used by the United States Census Bureau.

Table 3

Summary of Means, Standard Deviations, and Ranges of Academic Variables

Variable (N = 118)	*M (SD)*	Range
Age in years at start of program	29.75 (9.323)	16, 58
Grade on Medical Terminology course	4.46 (.687)	2, 5
Grade on Introduction to HIM course	4.62 (.569)	3, 5
Grade on Pathophysiology course	4.14 (.743)	2, 5
Grade on Coding course	4.25 (.786)	3, 5
Core curriculum grade point average	3.13 (.429)	2.30, 4.00
Professional curriculum grade point average	3.45 (.408)	2.45, 4.00
RHIA examination raw score	117.34 (16.277)	77, 151

Note: Grades on courses were computed where A=5, B=4, C=3, D=2, F=1. Grade point averages computed on the standard 4.00 scale. Highest score possible on the RHIA examination was 160.

Table 4

Frequency Distribution and Cumulative Percentage for RHIA Certification Examination Score

Raw Score	*n*	Percentage	Cumulative Percentage
71-80	1	0.9	0.9
81-90	7	5.9	6.8
91-100	13	11.0	17.8
101-110	21	17.8	35.6
111-120	22	18.6	54.2
121-130	26	22.0	76.2
131-140	20	17.0	93.2
141-150	7	5.9	99.1
151-160	1	0.9	100.0
Total	118		

Three research questions were answered to address the overarching research question. The following section reports significant findings for each research question.

Research Question One

The first research question was "which individual student demographic variables correlate with a passing score on the Registered Health Information Administrator examination?" The individual student demographics studied in this research project were race, ethnicity, mother tongue, and age at the start of the program. Race categories were

modeled on the categories used by the United States Census Bureau. Only 11 of the 180 graduates indicated a race other than White or Black; therefore, because of the dearth of cases in the remaining race categories, the decision was made to combine these cases with Blacks, creating two race categories, labeled as White and non-White. These categories were used in inferential statistical calculations. Only eight graduates were identified as Hispanic; this variable was omitted from the inferential statistical computations.

Significant findings.

The results of the correlation suggested that the mother tongue of the graduate was significantly associated with the score on the RHIA certification examination. A graduate whose mother tongue was not English was likely to score lower on the examination. Age in years at the start of the program exhibited an insignificant weak association with a higher score on the RHIA certification examination. The correlation between race and RHIA certification examination score was significant but weakly correlated; a graduate who was non-White was more likely to score lower on the examination. Table 5 presents the intercorrelations among the variables.

Table 5

Summary of Intercorrelations

	Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1.	Race	--	.283**	-.128	-.327**	-.234*	-.161	-.203*	-.295**	-.225*	-.270**
2.	Mother tongue	.283**	--	.202*	-.284**	-.262**	-.001	-.186*	-.090	-.082	-.308**
3.	Age at start	-.128	.202*	--	-.064	.017	.139	.022	-.035	.031	.134
4.	Grade on MT	-.330**	-.284**	-.064	--	.581**	.338**	.431**	.364**	.507**	.373**
5.	Grade on Intro HIM	-.234*	-.262**	.017	.581**	--	.273**	.563**	.354**	.647**	.600**
6.	Grade on Pathophys.	-.161	-.001	.139	.338**	.273**	--	.361**	.174	.590**	.269**
7.	Grade on Coding	-.203*	-.186*	.022	.431**	.563**	.361**	--	.450**	.685**	.670**
8.	Core Curric. GPA	-.300**	-.090	-.035	.364**	.354**	.174	.450**	--	.477**	.451**
9.	Pro. Curric. GPA	-.225*	-.082	.031	.507**	.647**	.590**	.685**	.477**	--	.569**
10.	RHIA exam score	-.270**	-.308**	.134	.373**	.600**	.269**	.670**	.451**	.569**	--

Note. MT = Medical Terminology; Intro HIM = Introduction to Health Information Management; Pathophys. = Pathophysiology; GPA = grade point average; Pro. = Professional; RHIA = Registered Health Information Administrator.
*$p < .05$. **$p < .01$.

Research Question Two

The second research question was "which individual student academic variables correlate with a passing score on the Registered Health Information Administrator examination?" The individual student academic variables studied in this research project were final course grades on Medical Terminology, Introduction to Health Information Management (HIM), Pathophysiology, and Coding. In addition, core curriculum grade point average (GPA) and professional curriculum GPA were studied.

Significant findings.

The results of the correlation suggested that the final grade in the Introduction to HIM course, final grade in the Coding course, and the professional curriculum GPA were all significantly strongly correlated with a higher score on the RHIA certification examination. The final grade in the Medical Terminology course and core curriculum GPA were both significantly moderately correlated with a higher score on the RHIA certification examination. It should be pointed out that it was unknown whether the grades obtained from the program directors, for students who had to repeat courses, were the result of the first or second attempt at completing the class. It is assumed that this number is small; however, in future similar study designs, this is an aspect of course grade collection that should be addressed in the methodology.

Research Question Three

The third research question was "can a Registered Health Information Administrator examination success prediction model be identified?" To test the hypothesis that demographic and academic variables including race, age, mother tongue, final course grades on Medical Terminology, Introduction to HIM, Pathophysiology, and

Coding, and grade point averages (GPA) of core and professional curricula can predict the final score on the RHIA certification examination, multiple regression analysis was performed.

Significant findings.

Results of the variance inflation factor (all less than 3.43), and collinearity tolerance (all greater than .28) suggested that the estimated βs were well established in the regression model. Race was the first variable entered, followed by age at the start of the program, core and professional curricula GPA, final course grades on Medical Terminology, Introduction to HIM, Pathophysiology, and Coding, and mother tongue. Therefore, the regression equation is RHIA certification examination score = (age at start [.274]) + (core curriculum score [6.103]) + (Intro to HIM grade [7.875]) + (Coding grade [8.152]) + (mother tongue [-9.893]) + 21.650. The variable mother tongue, the only categorical variable in the model, was expressed as 0 = English and 1 = non-English. The unstandardized regression coefficients (*B*) and intercept, the standard errors (*SE*); the standardized regression coefficients (β), *t*-values and *p*-values for the full model are reported in Table 6.

Table 6

Unstandardized Regression Coefficients (B) and Intercept, the Standard Error (SE), the Standardized Regression Coefficients (β), t-*values, and* p-*values for Variables as Predictor of the RHIA Certification Examination Score*

Variables	*B*	*SE*	β	*t*-value	*p*-value
Intercept (Constant)	21.650	11.771	1.039	.069	
Race	-.655	2.302	-.020	-.285	.776
Age in years	.274	.114	.157*	2.400	.018
Pro. curric. GPA	3.152	4.584	.079	.688	.493
Core curric. GPA	6.103	2.831	.161*	2.156	.033
Med. Term. grade	-2.436	1.946	-.103	-1.252	.213
Intro. to HIM grade	7.875	2.645	.275*	2.977	.004
Pathophys. grade	-.295	1.760	-.013	-.168	.867
Coding grade	8.152	1.836	.394*	4.441	.000
Mother tongue	-9.893	3.493	-.197*	-2.832	.006

Note. Age in years = Age in years at the start of the program; GPA = grade point average; Pro. curric. = Professional curriculum; Core curric. = Core curriculum; Med. Term. = Medical Terminology; Intro. to HIM = Introduction to Health Information Management; Pathophys. = Pathophysiology. The variable race was coded as 0 = White and 1 = non-White; The variable mother tongue was coded as 0 = English and 1 = non-English; R = .769, R^2 = .592

A separate regression was employed using the independent variables that expressed a significant β value. Table 7 reports the results of this analysis.

Table 7

Unstandardized Regression Coefficients (B) and Intercept, the Standard Error (SE), the Standardized Regression Coefficients (β), t-*values, and* p-*values for Variables as Predictor of the RHIA Certification Examination Score, Variables that Expressed a Significant* β *Value, Separate Regression*

Variables	*B*	*SE*	β	*t*-value	*p*-value
Intercept (Constant)	19.809	10.111		1.959	.053
Age in years	.285	.109	.163*	2.616	.010
Core Curric. GPA	6.187	2.618	.163*	2.364	.020
Intro. to HIM grade	7.435	2.173	.260*	3.421	.001
Coding grade	8.556	1.615	.413*	5.297	.000
Mother tongue	-9.112	3.244	-.182*	-2.809	.006

Note. Age in years = Age in years at the start of the program; GPA = grade point average; Core curric. = Core curriculum; Intro. to HIM = Introduction to Health Information Management. The variable mother tongue was coded as 0 = English and 1 = non-English; $R = .765$, $R^2 = .585$

An Approximate 95% Prediction Interval for the regression model was computed. Microsoft Excel 2010 was used to calculate the Approximate Margin of Error (AMOE) using the formula:

t-value * Approximate Standard Error of Prediction (ASEP) = AMOE

The *t*-value was computed by $t_{inv} = (.05, df)$ [$df = 108$], resulting in a *t*-value of 1.982. The ASEP was calculated by the Standard Error of the Estimate (SEE), 10.820, * 1.1, a standard practice (ProfTDub, 2010; Xeriland, 2012), that more accurately produces this value; its value was computed as 10.820 * 1.1 = 11.902. Therefore, the AMOE was calculated as 1.982 * 11.902, resulting in an AMOE of 23.592, and an Approximate 95%

Prediction Interval Width of 47.184. For example, if the regression equation predicted an RHIA certification examination score of 110, the Approximate 95% Prediction Interval lower bound would be 86 while the upper bound would be 134.

To test the predictive accuracy of the regression model and the Approximate 95% Prediction Interval, a separate second sub-sample of 80 graduate records was used. Upon inspection of the sub-sample records, a duplicate record was identified; it was removed, leaving 79 graduate records in the second sub-sample.

Data from each graduate record of the second sub-sample were computed for the predicted RHIA certification examination score using the regression model and employing the Approximate 95% Prediction Interval established by the first sub-sample. Of the 79 records, 72 (91.1%) contained actual RHIA certification examination scores that fell within the Approximate 95% Prediction Interval; of the remaining seven records whose actual RHIA certification examination scores fell outside of the Approximate 95% Prediction Interval, six were lower than the lower bound while one was higher than the upper bound. Appendix E reports the results of each record of the sub-sample used to test the regression equation and Approximate 95% Prediction Interval.

Summary

Three research questions were developed to determine whether differences existed among candidates for the Registered Health Information Administrator certification examination that may have characterized the likelihood of acquiring professional certification. De-identified former student data from accredited health information administration academic programs located in the United States were provided by program directors. The data were from former students who took the

Registered Health Information Administrator certification examination starting in 2001 through 2010. The dependent variable was the raw score of the graduates' first attempt taking the Registered Health Information Administrator certification examination. The independent variables were four demographic variables, including race, ethnicity, mother tongue, and age at the start of the program, and six academic variables including four final course grades and two grade point averages.

Pearson product-moment correlation was calculated; correlations between the independent variable and three dependent variables were found to be strong with significance ($p < .01$): final course grade in Coding, final course grade in Introduction to Health Information Management, and professional course curriculum grade point average. Correlations between the independent variable and three dependent variables were found to be moderate with significance ($p < .01$): final course grade in Medical Terminology, core curriculum grade point average, and mother tongue.

Multiple regression analysis was calculated to establish a prediction model for score on the Registered Health Information Administrator certification examination: predicted RHIA certification examination score = (age at start [.274]) + (core curriculum GPA [6.103]) + (Introduction to HIM grade [7.875]) + (Coding grade [8.152]) + (mother tongue [-9.893]) + 21.650. A 95% Approximate Prediction Interval was computed: Approximate Margin of Error = 23.592 with an Approximate 95% Prediction Interval Width of 47.184. A separate sub-sample of former student data was employed to test the prediction model; 91.1% of the actual RHIA examination raw scores fell within the 95% Approximate Prediction Interval.

The results presented in this chapter will inform the discussion in Chapter V. Chapter V will include an analysis of research findings, a discussion of the findings, conclusions, and implications for the field of education administration as well as recommendations for future studies.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Higher education leaders are responsible for creating, implementing, and maintaining educational programs in which students are able to flourish, acquire the field's appropriate knowledge, and ultimately become successful in their chosen careers (Hoy & Miskel, 2008). Higher education leaders of professional programs, particularly in the health sciences, have the added responsibility of insuring that graduates of their programs are competent to the extent that they can successfully complete professional credentialing or certification examinations after graduating from these programs (Eaton, 2001; Sandmann, Williams, & Abrams, 2009). Graduates in most health professions must first obtain professional certification before they are permitted to provide patient care. Programs whose graduates exhibit poor passing rates on certification examinations risk sanctions or loss of accreditation; the subsequent process of addressing the sanctions or regaining accreditation often diverts scarce resources away from the classroom. In extreme circumstances, poor professional certification results might lead to a program being discontinued (Glenn, 2011; Maize, Fuller, Hritcko, Matsumoto, Soltis, Taheri, & Duncan, 2010; Sifford & McDaniel, 2007). Fewer professional programs in existence would lead to fewer health care providers being prepared and graduated, and fewer health care providers in the field, potentially causing a negative impact on the quality of health care delivery.

As the life expectancy of Americans continues to increase, and as the huge Baby Boomer generation retires, the need for physicians, nurses, therapists, laboratory technicians, and other health professionals also continues to increase. The current health

care provider shortage is predicted to worsen in the coming years; when graduates of health professions programs are unable to acquire certification and unable to work in their fields, these shortages are exacerbated and the provision of optimal health care to all citizens becomes more elusive (Goodman & Fisher, 2008; National Academy of Sciences, 2008). Therefore, leaders of professional education programs in the health sciences have an important responsibility to insure that every program graduate is able to obtain professional certification and become a productive member of the health care delivery system.

Researchers in higher education, especially in the health sciences, have studied program characteristics and individual student characteristics in an effort to identify which characteristics are most closely associated with graduate success on professional certification examinations. Researchers in nursing, dental hygiene, and chiropractic, for example, have pinpointed certain program and student characteristics that are associated with successful outcomes on certification examinations (Green, Johnson, & McCarthy, 2003; Griffiths, Bevil, O'Connor, & Wieland, 1995; Henderson & Orr, 1989; Ward, Downey, Thompson, & Collins, 2010; Wilmore & McNeil, 2002). Education leaders can assess these characteristics and, if necessary, remediate weak students well before they graduate and take the certification examination, thereby increasing the graduates' likelihood of success. Examples of program characteristics include student-to-faculty ratios, program budgets, faculty experience in years, and number of student hours spent on professional practicum experiences. Examples of student characteristics include demographic attributes, grade point averages, final course grades on specific courses, age of the student, and GRE and SAT scores. The objective of these research studies was to

determine how to identify students that might benefit from additional coursework or remedial instruction to increase the likelihood of successful certification examination outcomes.

One health care profession that is not as familiar to the public as most other professions is health information administration. The professionals who work in this field are called health information administrators. Health information administrators manage health information; they do so by collecting, verifying, and safeguarding the demographic, financial, and health-related data and information generated as a result of the provision of patient care. Health information administrators are found in virtually all health care institutions as well as other settings such as health insurance companies, accounting firms, health care information system software vendors, and in various levels of government. The Registered Health Information Administrator (RHIA) certification examination is taken by graduates of accredited health information administration education programs to obtain professional certification in the health information administration field. Leaders of these programs, which prepare and graduate health information administrators, must insure that their graduates are adequately prepared to pass the RHIA certification examination, just as graduates in other health care disciplines must be sufficiently prepared to pass their professions' certification examinations.

Based on a thorough review of the literature and the health information administration profession's body of knowledge, no research was discovered that had examined individual student characteristics and their potential associations with the score obtained on the RHIA certification examination; therefore, a gap in the profession's knowledge base existed. The objective of the current research study was to explore for

such characteristics and to determine whether they could be used to predict the likelihood of success on the RHIA certification examination. The ability to predict the likelihood of success would be an important tool for health information administration educational program leaders.

A correlational research design was employed. Preexisting data of 118 randomly-selected graduates who had earned degrees from accredited health information administration programs and who had taken the RHIA certification examination were evaluated to determine whether individual student academic and/or demographic differences existed that suggested a tendency to achieve a higher score on the certification examination. The independent variables included race, ethnicity, mother tongue, age at the start of the program, final grades on four professional courses, core curriculum grade point average, and professional curriculum grade point average. The dependent variable was the raw score on the RHIA certification examination. Pearson product-moment correlation was computed to identify associations between the independent and dependent variables. Multiple linear regression was used to establish an RHIA certification examination success prediction model. The model then was tested using an independent sub-sample of graduate data.

The overarching research question was: What differences, if any, exist among candidates for the Registered Health Information Administrator certification examination that may characterize the likelihood of acquiring professional certification? To answer this question, three subquestions were examined. Analysis of each of the subquestions follows.

Analysis of Research Findings

Research Question One

The first subquestion was: Which individual student demographic variables correlate with a passing score on the Registered Health Information Administrator examination? To answer this question, four student demographic variables were examined: race, ethnicity, mother tongue, and the student's age at the start of the program. Only eight (6.7%) of the graduate records indicated ethnicity as Hispanic; therefore, this variable was not considered in subsequent analyses.

Discussion.

In previous research studies, race was found to be associated with the level of successful outcomes on certification examinations, with non-White students more often scoring lower on them (Agho, Mosley, & Williams, 1999; Chapman, 1989; Haas, Nugent, & Rule, 2004; Sayles, Shelton, & Powell, 2003; Scott et al., 1995). The result of this study suggested that race was weakly correlated ($r = -.270$, $p < .01$) with score on the RHIA certification examination. Non-White students attained a lower score on the examination than did their White counterparts. Research has attributed this disparity to several phenomena including an achievement gap between Whites and non-Whites and test bias on examinations (Burchinal, Steinberg, Friedman, Pianta, McCartney, Crosnoe, & McLoyd, 2011). Steele (2004) called this disparity in test scores an "ability paradigm" (p. 39). The research result affirmed the findings of previous research.

Several previous studies suggested that the student's mother tongue should be considered when conducting educational research (Zwick & Sklar, 2005). The results of the current research revealed a moderate correlation ($r = -.308$, $p < .01$) between mother

tongue and score on the RHIA certification examination; students whose mother tongue is not English achieved a lower score. The RHIA certification examination was offered only in English; the majority of the examination was composed of questions at the higher taxonomic levels of application and analysis for which increased fluency in the English language was critical. Program directors should insure that the admission process mandates that students for whom English is a second language complete the Test of English as a Foreign Language (TOEFL); results may identify students whose English language skills might place them at a disadvantage in both comprehending the required curricular material and in the ability to answer test questions at higher taxonomic levels. These students can likely benefit from language intervention strategies such as English as a second language studies.

Earlier research revealed that a student's age was associated with success on professional certification examinations; the older the student, the higher the score (e.g., Campbell & Dickson, 1996; Humphreys, 2008; Schofield & Dismore, 2010). The current research, however, suggested that age was only weakly correlated (r = .134) with score on the RHIA certification examination, suggesting that age of the student played a less important role that had been anticipated. The absence of a stronger correlation could be attributed to the nature of the program–as a professional program, younger students, who might otherwise have exhibited less motivation than their older classmates, perceived that employment opportunities for RHIAs upon graduation were abundant, and understood the importance of passing the RHIA certification examination and the significance of a high score in achieving that objective. Regardless of age, graduates appeared to have

been adequately prepared and sufficiently inspired to achieve higher scores on the RHIA certification examination.

In answering subquestion one, the results of the research suggested that, when considering demographic variables, the student's mother tongue was moderately correlated with the score on the RHIA certification examination; a student whose mother tongue is not English was more likely to achieve a lower score on the examination. Therefore, program directors should contemplate ascertaining a student's mother tongue; if it is not English, program directors may consider assessing fluency of the student's English. A standard process for assessing such students, coordinated through the Admissions Office and academic programs designed to address English fluency, would serve to mitigate this potential obstacle.

Research Question Two

The second subquestion was: Which individual student academic variables correlate with a passing score on the Registered Health Information Administrator examination? To answer this question, six student academic variables were examined: Core curriculum grade point average (GPA), professional course GPA, and final course grades in Medical Terminology, Introduction to Health Information Management (HIM), Pathophysiology, and Coding.

Discussion.

Two final course grades exhibited strong correlations with RHIA certification examination scores: Introduction to HIM ($r = .600$, $p < .01$) and Coding ($r = .670$, $p < .01$). The final course grade in Medical Terminology was moderately correlated with RHIA certification examination score ($r = .373$, $p < .01$), moderately correlated with final

course grade in Coding ($r = .431$, $p < .01$), and strongly correlated with final course grade in Introduction to HIM ($r = .581$, $p < .01$). The correlations suggested that Medical Terminology was a key course to student success in the Coding and Introduction to HIM courses; the final grades of both of these courses were strongly correlated with scores on the RHIA certification examination. Program directors should insure that their students obtain a solid Medical Terminology background regardless of whether the course is offered by the program or is transferred in after being completed in a different program or at another institution. In addition, a solid Anatomy and Physiology background, required courses for health information administration students, may also positively impact student success in Medical Terminology; program directors may find it beneficial to explore the rigor of their students' Anatomy and Physiology courses. Program directors should also assess the robustness of the Introduction to HIM and Coding courses as they appear to function as sentinel courses, serving as prognosticators for success on the RHIA certification examination.

The Introduction to HIM course content covers a broad array of foundational concepts upon which subsequent courses with narrower foci are built, and the strong correlations between the final grade in this course with the final grade in the Coding course ($r = .581$, $p < .01$) and with the score on the RHIA certification examination provided evidence of these foundational relationships. The strong correlation between the final grade in the Coding course and RHIA certification examination score may indicate that students who were able to master coding principles, the primary content area addressed in the Coding course, had developed a more advanced cognitive ability to function at the higher levels of the learning taxonomy. This may translate to better

outcomes on the RHIA certification examination since the majority of the questions on the examination are at the higher cognitive levels. Evidence for this was further supported by the strong correlations between final grade on the Coding course and professional course GPA ($r = .685$, $p < .01$) and professional course GPA and RHIA certification examination score ($r = .569$, $p < .01$). Previous research had established that certain professional or core courses and GPAs were associated with increased success on professional certification examinations (Daley, Kirkpatrick, Frazier, Chung, & Moser, 2003; Newton & Moore, 2007; Shirrell, 2008; Uyehara, Magnussen, Itano, & Zhang, 2007); the current research supports these findings.

Answering research subquestion two, the results of the current research suggested that program directors should thoroughly evaluate the Medical Terminology, Introduction to HIM, and Coding courses to insure that the course curricula address appropriate Domains, Sub-domains, Tasks, and Knowledge Clusters as specified in the Commission on Accreditation for Health Information and Informatics Education Curriculum Blueprint as well as the RHIA Examination Content Outline, published by the Commission on Certification for Health Informatics and Information Management. Course instructors should be aware of the importance of these courses and be able to recognize students who demonstrate difficulty with mastering the course content. Policies and processes should be in place that specify when and what type of remediation should be offered to these students.

Research Question Three

The third subquestion was: Can a Registered Health Information Administrator examination success prediction model be identified? In an effort to answer this question,

multiple regression analysis was employed to establish a prediction model for score on the RHIA certification examination. Subsequently, a 95% Approximate Prediction Interval was computed. A separate sub-sample of former student data was then employed to test the prediction model; 91.1% of the actual RHIA certification examination raw scores fell within the 95% Approximate Prediction Interval. The third research subquestion was answered in the affirmative with the successful generation of a prediction model for the RHIA certification examination.

Discussion.

The prediction model's Approximate Margin of Error is 23.592; the Approximate 95% Prediction Interval Width of 47.184 (ProfTDub, 2010; Xeriland, 2012). The interval width is large and, therefore, its usefulness as a tool of prediction may be limited. For example, the minimum passing score on the RHIA certification examination was either 102 or 103 during the current study's data collection time frame. If the prediction model generated in the current study had been employed, a student would have had to achieve a result of 126 or higher or 127 or higher (depending on the year) on the prediction model to obtain a 95% likelihood of achieving a passing score on the RHIA certification examination. Based on an analysis of actual RHIA certification examination scores from sub-sample two, however, 54 of the 79 graduate records (68.3%) returned a predicted score between and including the lower interval of the margin of error's lower and upper range of 102 and 127, the interval in which the likelihood of passing the examination decreases from 95%. What actions might a program director recommend to this cohort consisting of over two-thirds of the students? The following paragraph details one suggestion for how to proceed with such a cohort of students.

For a cohort of students caught in the above-described prediction model's less than 95% likelihood interval, which could be referred to as "no man's land," other tools discovered during the current research, such as GPAs of core and professional curricula, final course grades on the two sentinel courses, Introduction to HIM and Coding, and the predicted score itself could be analyzed to assist with a remediation decision and instructional plan for these students. An important question that must be considered is: Should a student with a predicted score of 127 receive the same intensity of remediation as the student with a predicted score of 105, just because both of their scores reside in the "no man's land" interval? Experience and intuition of course instructors or the recommendations of an informed faculty panel certainly have their places in such decisions. However, a score of less than 128, the predicted score at which a student is virtually assured to pass the RHIA certification examination, could serve as an initial marker for initiating the remediation decision process.

Summary

The overarching research question was: What differences, if any, existed among candidates for the Registered Health Information Administrator certification examination that may have characterized the likelihood of acquiring professional certification? The current research suggested that a series of demographic and academic variables of graduates of health information administration education programs are associated with the likelihood of higher scores on the certification examination and the achievement of professional certification. In addition, a model generated by the statistical manipulation of a subsample of data from graduates of health information administration education programs was 91.1% accurate in predicting actual Registered Health Information

Administrator certification examination scores. The results of the three research questions have answered the overarching research question.

Implications

The results of the current research provide an important set of tools for leaders of health information administration education programs. Up to this point, leaders have not had access to quantitatively-produced information to help them make decisions regarding students' levels of readiness to take the RHIA certification examination. Therefore, the outcomes of the current research fill a gap in the profession's body of knowledge. The results provide a menu of demographic and academic variables that correlate with higher scores on the RHIA certification examination and make available an RHIA certification examination score prediction model that educational leaders can employ in an effort to gauge the level of student readiness.

It is recommended that each student be assessed, using the tools described in this report, before the beginning of the student's final year of the program. At that time, all of the data required to populate the regression equation should be available and the sentinel courses, Coding and Introduction to HIM, should already have been completed with grades available for each. Program directors should derive each student's predicted RHIA certification examination using the regression equation. Students with predicted examination scores that fall into the earlier described "no man's land," defined as the interval between the RHIA certification examination minimum passing score and the total of Approximate Margin of Error added to the examination minimum passing score, could then be assessed for remediation intensity using the sentinel course grades and the professional judgment of the faculty. Likewise, the predicted scores of students which fall

just above the minimum RHIA certification examination passing score or below are candidates for intensive remediation. If remediation is required, sufficient time remains, in most cases two semesters, for the student to receive the remediation before graduation and subsequent eligibility to take the RHIA certification examination.

The ability to identify students for remediation before they take the certification examination will lead to an increased number of graduates achieving higher scores on the certification examination, which will escalate the likelihood of a graduate obtaining certification as a Registered Health Information Administrator. Benefits to higher education leaders and their programs include a higher percentage of first-time examination takers passing the examination and, therefore, the successful attainment of an important program benchmark by which the program is assessed by stakeholders, including accrediting entities. The college or university to which the program belongs also benefits by extending its opportunity to offer the program and, through received tuition and research dollars, its bottom line is positively affected.

Other beneficiaries include the students themselves. Success on a professional examination is an experience that bolsters the candidate's self-confidence, essential for professional competence. Failure, on the other hand, could lead to delayed career plans and potential financial difficulties for the candidate. A higher passing rate on the certification examination provides additional relief to a profession that is consistently unable to address shortages of certified personnel in the field. The health care delivery system and patients benefit by the presence of credentialed professionals, in greater numbers, properly caring for confidential patient, demographic, and financial information.

Health care institutions and their revenue streams will profit from the current research by having increased access to properly credentialed professionals who are trained in the art and science of determining optimal reimbursement for services rendered to patients. Finally, as a health information administration program director, the researcher will be a beneficiary of the results as students in the researcher's program will be assessed for RHIA certification examination readiness.

Recommendations

Based upon the research findings, the following are recommendations to health information administration education program leaders and to the health information administration profession:

1. Program directors are advised to examine the current research and, using the prediction model in conjunction with the findings regarding demographic and academic variables that display moderate and strong correlations with the RHIA certification examination score, consider employing a process by which weaker students are identified and remediated;
2. Program directors, who decide to implement some process of identifying and remediating weak students, should contemplate maintaining statistics on the accuracy of the prediction equation–specifically, the number of students whose predicted scores are below the 95% remediation marker, amount and type of remediation provided to them, and actual scores obtained on the RHIA certification examination;
3. Program directors who decide to employ such an identification/remediation process are encouraged to share their results with their colleagues at regional

and national meetings that have a focus on health information administration education, and in print venues, such as the *AHIMA Academic Advisor* and *Perspectives in HIM* electronic journals to effect maximum dissemination;

4. The American Health Information Management Association, as the national professional body of health information administrators, through the Commission on Accreditation for Health Informatics and Information Management (CCHIIM), should collect data on graduates who take the RHIA certification examination, de-identify the data, and make them available to education researchers. Attempting to acquire graduate data from individual programs, such as the data items requested in this study, is a difficult, time consuming process with no guarantee of success. Education researchers in the profession could come together, for example, and determine which data items would be beneficial if collected and made available for research; CCHIIM could implement such a data collection plan. Less impeded access to certification examination data might also encourage more research in this area; based on a review of the literature, the health information administration profession is far behind other health profession educators in certification examination success research.

The results of current research also raise additional questions and provide direction for potential future research:

1. Does elapsed time between the graduation date and the date of the examination affect the RHIA certification examination score?

2. Do other variables exist that are moderately or strongly correlated with the RHIA certification examination score?
3. Do graduates who are in possession of the Registered Health Information Technician credential prior to completing a health information administration program score higher on the RHIA certification examination?

Dissemination

Results of the current research will be disseminated in several ways. A presentation to the members of the Consortium of Health Informatics and Information Management Educators will take place at its annual meeting in March, 2014, at Georgia Regents University in Augusta, Georgia. Results of the research will also be presented to a larger group of educators at the American Health Information Management Association's Assembly on Education Symposium in the summer of 2014. Finally, an article addressing the research will be submitted to the health information administration profession's flagship peer-reviewed journal, *Perspectives in HIM,* for publication.

Concluding Thoughts

Public higher education is big business; however, with government budgets stagnant or shrinking, with an environment that is not favorable to raising taxes, and with more parties demanding a slice of an ever-shrinking budget pie, higher education leaders at all levels already have or soon will face a new reality: resources are tight. They are being admonished to run their departments or programs like businesses by being mindful of costs while providing positive, concrete results. Education program directors in the health professions are in a position to impact outcomes, particularly when it comes to their graduates' results on professional certification examinations. The health information

administration profession's educators have not had access to many tools that might be helpful in assessing the readiness of their students to take the profession's certification examination. This absence of such tools affects the ability of program directors to maximize student outcomes and, with marginal or poor outcomes, their programs might be placed at risk. This research study, built upon the 2005 research by McNeill and Brockmeier, attempted to take baby steps toward identifying a tool with the hope that other researchers will build upon these results, thereby benefiting all education leaders in health information administration.

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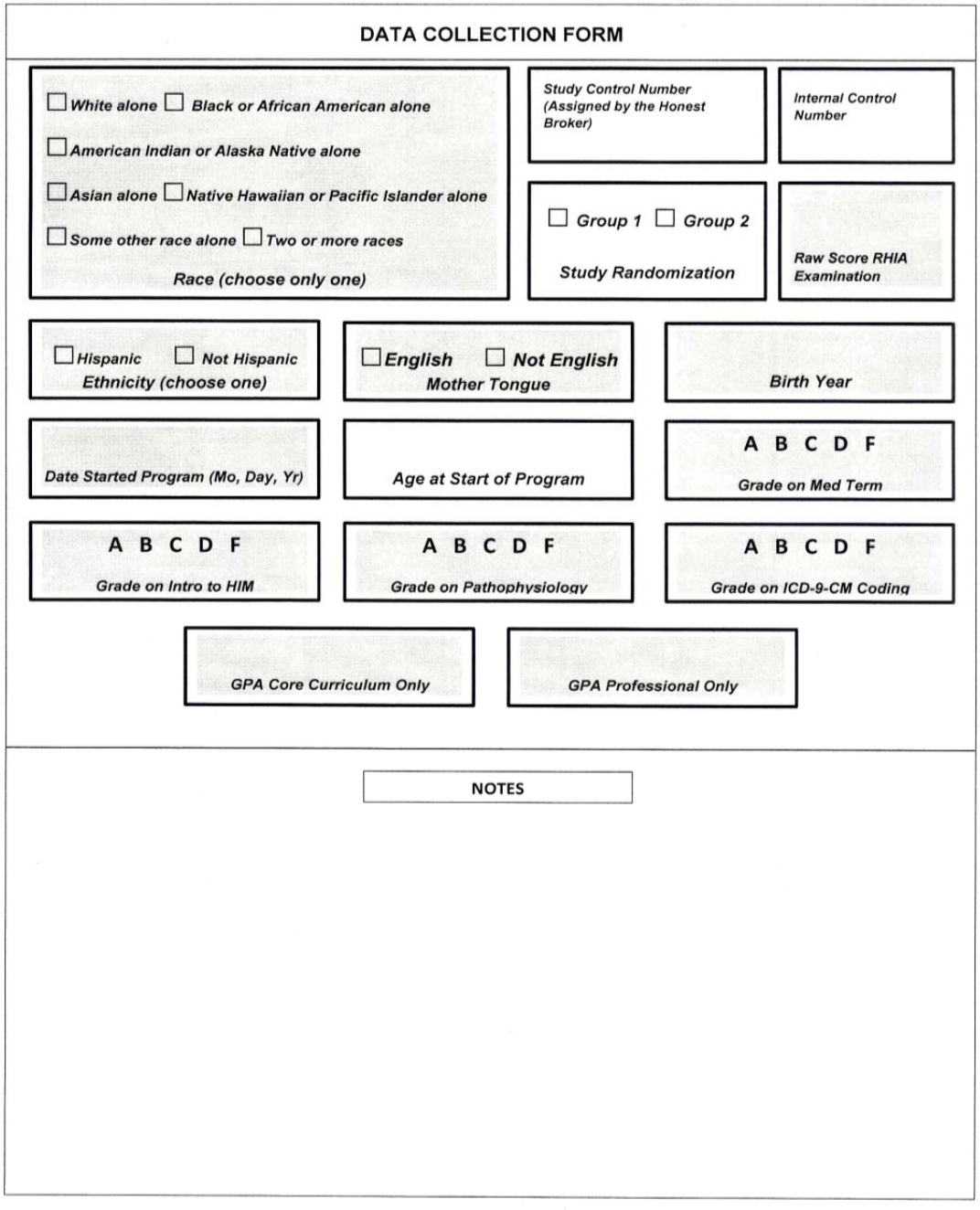
APPENDIX A

DATA COLLECTION INSTRUMENT



DATA COLLECTION FORM

☐ White alone ☐ Black or African American alone
☐ American Indian or Alaska Native alone
☐ Asian alone ☐ Native Hawaiian or Pacific Islander alone
☐ Some other race alone ☐ Two or more races
Race (choose only one)

Study Control Number (Assigned by the Honest Broker)

Internal Control Number

☐ Group 1 ☐ Group 2
Study Randomization

Raw Score RHIA Examination

☐ Hispanic ☐ Not Hispanic
Ethnicity (choose one)

☐ English ☐ Not English
Mother Tongue

Birth Year

Date Started Program (Mo, Day, Yr)

Age at Start of Program

A B C D F
Grade on Med Term

A B C D F
Grade on Intro to HIM

A B C D F
Grade on Pathophysiology

A B C D F
Grade on ICD-9-CM Coding

GPA Core Curriculum Only

GPA Professional Only

NOTES

APPENDIX B

GEORGIA SOUTHERN UNIVERSITY IRB APPROVAL

Georgia Southern University
Office of Research Services & Sponsored Programs

Institutional Review Board (IRB)

Phone: 912-478-0843
Fax: 912-478-0719
IRB@GeorgiaSouthern.edu
Veazey Hall 2021
P.O. Box 8005
Statesboro, GA 30460

To: James Condon
Dr. Yasar Bodur

cc: Charles E. Patterson
Vice President for Research and Dean of the Graduate College

From: Office of Research Services and Sponsored Programs
Administrative Support Office for Research Oversight Committees (IACUC/IBC/IRB)

Date: 05/02/12

Initial Approval Date: 05/02/12

Expiration Date: 04/30/13

Subject: Status of Application for Approval to Utilize Human Subjects in Research

---

After a review of your proposed research project numbered **H12432** and titled **"Predicting Registered Health Information Administrator Examination Scores,"** it appears that your research involves activities that do not require full approval by the Institutional Review Board according to federal guidelines.

According to the Code of Federal Regulations Title 45 Part 46, your research protocol is determined to be exempt from full review under the following exemption category(s):

B4 Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

Therefore, as authorized in the Federal Policy for the Protection of Human Subjects, I am pleased to notify you that your research is exempt from IRB approval. You may proceed with the proposed research.

Please notify the IRB when you have completed the project by emailing irb@georgiasouthern.edu. Include the date of completion, the number of subjects (records) utilized and if there were any unexpected events related to the subjects during the project. (If none, state no unexpected or adverse events occurred during the conduct of the research.)

Sincerely,

Eleanor Haynes
Compliance Officer

APPENDIX C

GEORGIA HEALTH SCIENCES UNIVERSITY IRB APPROVAL

IRB: Study Correspondence Letter
hac@georgiahealth.edu
Sent: Tuesday, September 11, 2012 12:14 PM
To: Condon, Jim

Date:	9/11/2012
HAC File #:	Pro00000731 , Predicting RHIA Exam Scores
Protocol Title	Predicting Registered Health Information Administrator Examination Scores
PI Name	James Condon
Approval Date	9/10/2012

The above-referenced protocol was examined and found to be exempt from review by the Human Assurance Committee (HAC) chairperson or designee in accordance with 45 CFR 46 and the institutional assurance on file with the Department of Health and Human . The Protocol qualifies for the following exemption criterion/criteria:

(4) Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

Continuing review is not equired for exempt protocols.

It must be noted that if the scope of the research project noted above changes to include the following criterion then it must be re-submitted to the HAC for review and approval as an expedited or full review protocol prior to implementing the changes:

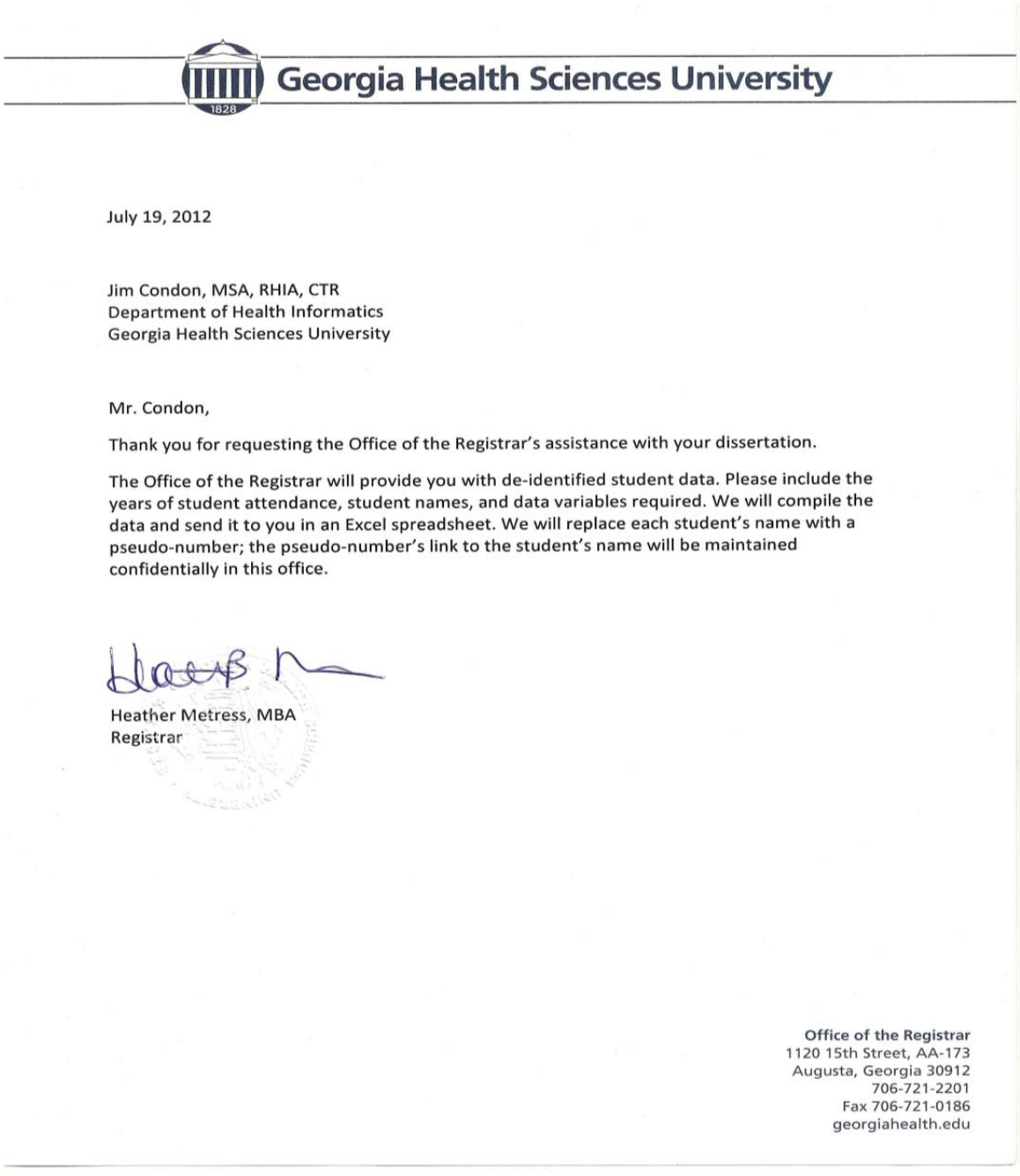
1. collection of protected health information
2. collection of data beyond the originally approved time period
3. direct contact with research subjects

Future research projects that may qualify for exempt review must be submitted to the HAC.
Please feel free to contact our office at 706-721-3110 if you have any questions.

Human Assurance Committee (HAC)
Georgia Health Sciences University
1120 15th St., CJ-2103
Augusta GA 30912-7621
HAC@georgiahealth.edu
Office 706-721-3110 http://www.georgiahealth.edu/research/ohrp/irb/hac/index.html

APPENDIX D

GEORGIA HEALTH SCIENCES UNIVERSITY REGISTRAR DATA PROVISION APPROVAL



Georgia Health Sciences University

July 19, 2012

Jim Condon, MSA, RHIA, CTR
Department of Health Informatics
Georgia Health Sciences University

Mr. Condon,

Thank you for requesting the Office of the Registrar's assistance with your dissertation.

The Office of the Registrar will provide you with de-identified student data. Please include the years of student attendance, student names, and data variables required. We will compile the data and send it to you in an Excel spreadsheet. We will replace each student's name with a pseudo-number; the pseudo-number's link to the student's name will be maintained confidentially in this office.

Heather Metress, MBA
Registrar

Office of the Registrar
1120 15th Street, AA-173
Augusta, Georgia 30912
706-721-2201
Fax 706-721-0186
georgiahealth.edu

APPENDIX E

SUB-SAMPLE TWO: PREDICTED AND ACTUAL RHIA EXAMINATION SCORES AND APPROXIMATE 95% PI UPPER AND LOWER BOUNDS (N=79)

	RHIA Exam Score		Approximate 95% PI	
Number	Predicted	Actual	Lower bound	Upper bound
001	130	134	107	154
003	115	123	91	138
004	137	128	113	160
006	137	136	113	160
007	117	129	93	140
009	120	103	97	144
011	138	132	114	161
012	134	133	110	158
013	100	101	77	124
017	124	106	100	147
018	132	149	108	156
019	124	116	101	148
022	104	74*	81	128
025	112	116	88	135
027	109	127	85	132
029	126	127	103	150
030	123	124	99	147
037	101	93	77	124
039	107	126	84	131
040	106	100	83	130

	RHIA Exam Score		Approximate 95% PI	
Number	Predicted	Actual	Lower bound	Upper bound
042	114	125	91	138
045	98	128*	74	122
046	122	134	99	146
047	110	105	86	133
052	124	98*	101	148
053	120	132	96	143
056	100	97	76	124
059	125	129	101	149
061	106	78*	82	130
063	99	107	75	122
066	119	130	95	143
067	106	87	83	130
068	110	110	86	133
070	116	114	92	139
071	118	125	95	142
072	130	140	106	152
080	126	142	103	150
081	120	136	96	143
086	95	107	71	119
087	112	99	88	136
089	117	125	93	140

	RHIA Exam Score		Approximate 95% PI	
Number	Predicted	Actual	Lower bound	Upper bound
092	97	108	73	121
095	97	106	73	120
096	90	82	66	113
102	135	117	112	159
105	109	126	86	133
110	114	77*	90	137
111	107	96	83	131
113	125	142	102	149
120	135	141	111	158
126	119	110	95	142
128	116	132	93	140
133	127	130	103	150
134	126	131	102	149
137	116	133	92	139
138	86	86	62	109
139	133	124	109	157
141	132	141	109	156
145	126	108	102	150
154	119	104	95	143
155	127	133	103	150
156	116	134	92	140

	RHIA Exam Score		Approximate 95% PI	
Number	Predicted	Actual	Lower bound	Upper bound
159	103	103	79	127
161	115	128	91	139
165	133	125	110	157
166	110	125	86	133
169	126	119	103	150
173	136	136	112	159
174	124	130	100	147
175	115	85*	91	139
176	107	98	84	131
177	124	126	101	148
179	121	129	98	145
180	130	124	106	154
185	118	133	95	142
192	99	109	76	123
195	108	70*	84	131
196	113	109	89	136
197	107	115	84	131

Note. Number = sub-sample record number; RHIA = Registered Health Information Administrator; PI = prediction interval; all figures rounded to the nearest whole number; * = actual scores that fell outside the bounds of the Approximate 95% PI (n=7).