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Community college nursing and allied health education programs, and Iowa's healthcare workforce

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Community college nursing and allied health education programs, and Iowa's healthcare workforce

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

As the nation's population ages and the Baby Boom generation nears retirement, the need for skilled healthcare workers in Iowa and across the nation grows. Healthcare is one of the fastest growing sectors of the U.S. economy, and one of the top industries for job growth and job creation in Iowa. The increase in the number of healthcare positions required—combined with the rapid and complex changes in healthcare delivery and healthcare technology—places an increased burden on Iowa's healthcare education system in its charge to provide an adequate supply of skilled healthcare workers.

Iowa's comprehensive community colleges play a crucial role in meeting the needs of Iowa's healthcare workforce. Their mission to meet the education needs of learners in their communities, combined with their flexibility and agility in content development and delivery enables them to meet the education needs of Iowans seeking career education, training, or re-training. These factors also place Iowa's community colleges in a strategically relevant position of making significant contributions to help address the impending healthcare worker shortage.

This study provided an in-depth analysis of how Iowa's community colleges are involved in meeting the need for healthcare workers in the state. The study included an analysis of trends, and demographic and geographic characteristics of healthcare professionals who are educated in Iowa's 15 community colleges to determine how community college graduates are meeting the need for a skilled

healthcare workforce across the state, particularly in parts of Iowa that suffer from a lack of adequate healthcare services and healthcare infrastructure.

CHAPTER 1. INTRODUCTION

Statement of the Problem

In Iowa a confluence of events and circumstances is creating a healthcare crisis. The National Census Bureau estimates that the population of Iowa has increased by 2% since 2000 (U.S. Census Bureau, 2003). Iowa has the nation's third highest percentage of residents over age 65, the second highest percentage of those over 75 years old, and the highest percentage of citizens 85 years of age and older (U.S. Census Bureau, 2003). As Iowa's population continues to age and healthcare workers in their 50s and 60s near retirement, a generation of skilled healthcare providers is preparing to exit the work force and transition from healthcare provider to healthcare consumer.

The National Bureau of Labor (2003) statistics has estimated that, by 2010, almost 7 in 10 new jobs created will be in the health service industry. In Iowa it is estimated that, from 1998 to 2009, healthcare services will be one of the faster growing industries in the state, second only to business services (Iowa Department of Public Health, 2003). Added to this, the U.S. Census Bureau (2002) projected a continued exodus of young people from the state of Iowa. The 2002 projection estimated that, by 2015, the number of 18-24 year olds would decrease from 288,000 to 266,000. With the young workforce leaving and the older workforce retiring, the potential exists for a significant increase in unfilled healthcare jobs.

In 2004, 60% of registered nurses in Iowa were 43 years of age or older (Iowa Department of Public Health, 2004). A Governor's Taskforce (Pederson, 2002) on the state's nursing shortage reported that, in 2001, Iowa had 2,500 vacancies for registered nurses, 700 vacancies for licensed practical nurses, and 2,600 vacancies for other Allied Health professionals. A report by the Iowa Department of Public Health's Center for Health Workforce Planning estimated that the shortfall of nurses in Iowa is projected to increase from 8% in 2005 to 27% in 2020. In 2004, this shortfall represented approximately 25% of the number of actively licensed RNs in Iowa (Iowa Department of Public Health, 2004) (Table 1.1).

Table 1.1. Projected RN shortfall in Iowa and U.S. by year- 2000-2020

	2000	2005	2010	2015	2020
Iowa	7% (1,900)	8% (-2,300)	11% (-3,400)	18% (-5,800)	27% (-9,100)
U.S.	6% (-110,800)	10% (-218,800)	17% (-405,800)	27% (-683,700)	36% (-1,016,900)

Source: U.S. Bureau of Labor Statistics 2004.

A report commissioned by the Iowa Hospital Association (Norris, 2006) revealed that, in 2005, vacancies for skilled healthcare workers in Iowa's hospitals ranged from 8% to 44%. A May 2004 presentation by Patrick J. Kelly (2004) from the National Center for Higher Education statistics identified Iowa as being a "High Production/Exporter of Capital" in describing the state's ability to produce graduates versus its ability to keep and attract graduates. In this report, Kelly identified Iowa as 8th in the nation in number of degrees awarded in registered nursing per 1,000

registered nursing occupations (44.8%) and 12th in the nation in degrees awarded in all other health programs per 1,000 health occupations (51.1%).

Iowa appears to be performing well in producing skilled healthcare workers. What is less certain is how successful the state is regarding its ability to retain these new healthcare workers. The outbound migration of this pool of human capital is at the heart of the healthcare worker shortage in Iowa. Factors influencing this exodus of skilled workers from the state include the economic challenges of a rural state with small communities, a high proportion of elderly citizens with complex medical and social needs, the significant cost and subsequent loan burden of a postsecondary education, low pay in health fields related to the Medicare reimbursement rates in Iowa, and the aggressive recruitment and incentive programs by other states, particularly the border states of Illinois and Minnesota. In 2004 a registered nurse in Iowa earned $9,000 less than the national average and $11,000 less than an RN working in the border state of Minnesota (Iowa Department of Public Health, 2004). In 2006, the national mean average wage for registered nurses was $57,280, while in Iowa it was $47,030 (Iowa Nurse Taskforce, 2007).

The geriatric and chronically ill populations in the United States are currently reaping the benefits of unprecedented advances in healthcare and medical technology. From 1998 to 2002, the median age of Iowans increased 1.4 years (U.S. Census Bureau, 2003). With this increase in longevity, individuals need more comprehensive and sophisticated health care. Increased numbers of Iowans with chronic, long-term conditions such as diabetes, heart disease, kidney failure, and cancer are driving the need for a diverse and well-educated healthcare workforce

that can respond and adapt to changes in medicine and healthcare. Advances in research and medical technology have enabled physicians and other healthcare providers to treat patients with medications, therapies and interventions that enable Iowans and people throughout the nation to live longer, more satisfying lives. What has resulted is a positive feedback cycle where improved healthcare and advances in healthcare technology lead to longer life-spans, and often more complicated and specialized care pathways. This cycle, in turn, produces a demand for more healthcare workers, especially those with an increased specialized and highly technical knowledge base and skill set. No longer does a student train to simply become a radiology technician. He or she may specialize in interventional cardiology or diagnostic oncology, and may even specialize further to utilize one specific machine or intervention. Postsecondary education institutions are helping to meet these needs, especially community colleges that offer nursing and Allied Health career and technical training.

Purpose of the Study

The purpose of this study was to analyze Iowa's community college career health education programs and the students who graduate from these programs. As community colleges train and educate students for careers in healthcare, the question arises: To what extent are these students meeting the needs of Iowa's healthcare labor force? One goal of this study was to evaluate and determine the impact that Iowa's community colleges have had on addressing the state's healthcare worker shortage. Of particular interest was answering the question: What

is the relationship between individuals who complete nursing and Allied Health programs at Iowa's community colleges and go on to work in the medically underserved areas (MUAs) and for the medically underserved populations (MUPs) of Iowa?

A second goal was to gain insight into the demographics and career characteristics of students who completed training in career health programs at community colleges. With Iowa's 15 community colleges offering a wide array of health degree, diploma, certificate, and other programs, the impact of the community colleges' contribution to Iowa's healthcare workforce and a demographic snapshot of the health care professional being trained at the community college level can provide valuable insight regarding how Iowa is addressing the healthcare worker shortage.

While the education of physicians and bachelaureate nurses has historically been the purview of four-year colleges, community colleges in Iowa offer credit and non-credit technical training for 39 nursing and Allied Heath programs in disciplines including dental assisting, occupational therapy, respiratory therapy, nurse aide, nursing, and emergency medical services (Table 1.2). According to a recent report by the Iowa Department of Education (2006), 14.4% of all credit-seeking students in Iowa's community colleges listed "Health" as their major, accounting for 36% of students enrolled in career and technical education (CTE) programs.

Community colleges, by virtue of their mission, seek to serve the constituents in their communities. They are able to respond quickly to changes in healthcare technology, and the need for new types of education and training for individuals and healthcare institutions. Community colleges are able to offer students specialized

Table 1.2. Iowa Nursing and Allied Health career programs by Classification of Instruction Program (CIP)

CIP Number	CIP Description
51010102	Chiropractic Assistant
51060101	Dental Assisting
51060200	Pre-Dental Hygiene
51060202	Dental Hygiene
51060302	Dental Laboratory Technology
51070102	Health Care Administration
51070505	Medical Office Management- Advanced Standing
51070702	Health Information Technology
51070801	Health Information Transcription
51079900	Health & Medical Administrative Services
51080101	Medical Assisting
51080102	Associate Degree- Medical Assisting
51080302	Occupational Therapy Assisting
51080501	Pharmacy Assisting
51080602	Physical Therapy Assisting
51090302	Electroneuroencephagraph Technology
51090402	Emergency Medical Technology- Paramedic
51090420	Emergency Medical Technician- Basic I
51090430	Emergency Medical Technician- Intermediate
51090462	EMT- Iowa Paramedic Specialist
51090702	Radiologic Technology
51090802	Respiratory Therapy
51090901	Surgical Technology
51091000	Diagnostic Medical Sonography
51091200	Magnetic Resonance Imaging (MRS)
51100402	Medical Laboratory Technology
51100700	Phlebotomy
51150102	Alcohol/Drug Abuse Specialty
51150202	Mental Health/Human Svcs Technician
51160102	Nursing, Associate Degree
51160105	Nursing, Advanced Standing
51160120	Nursing, Surgical
51161301	Practical Nursing
51161400	Nursing Assistant
51180201	Optometric Assisting
51239900	Rehabilitation Services, Other
52040401	Medical Secretary Specialist*
52040402	Medical Administrative Secretary Management*
52040412	Medical Secretary- Transcription Management*

**Business and Management CIP.* Source: Iowa Department of Education MIS Data Dictionary, 2002

training, and education that accommodates diverse ages, abilities, career objectives and lifestyles. Many graduates of community college career health programs go on to careers in the healthcare industry and, as a result, have an impact on the shortage of skilled healthcare workers in the state and across the country.

Theoretical Framework

The theoretical framework for this study is human capital theory. Human capitol theory applies an economic approach to the evaluation of the cost and benefits of the investment in skills and knowledge (van Loo, 2004). When viewed through the lens of human capitol theory, the need for an increased number of skilled healthcare workers in Iowa can be described in terms of supply and demand. In order for Iowa to meet the supply needs for human capital it must be aware of and maximize existing resources (Doeksen et al., 1997).

Human capital, in the form of skilled healthcare workers, is an asset or a commodity. It is generally accepted that the value of this asset will increase with an increase in education or training. The increased demand for skilled healthcare workers is driven by the decreased supply, increased need for medical services, and the changes and advances in healthcare and healthcare technology. When viewed in this context, the problem that Iowa and the rest of the nation face is fundamentally an economic one. What complicates the equation is the fact that it is not possible to separate the person from his or her knowledge or skills (Becker, 1964). While financial models and monetary standards can explain much of the actions and behaviors in human capitol theory it is the human element that makes human capital

theory a nuanced framework. While the theory assumes that education is a good thing in that it raises income and increases output or productivity (Becker, 1964), it also states that increases in income or monetary incentives are not the sole motivating factor or predictor of behavior in the model.

Van Loo and Rocco (2004) stated, “The decision of whether and how much to invest in training can be analyzed using standard principles from cost-benefit analysis” (p. 5). Using human capital theory to frame the problem community colleges face can be viewed as a link in the supply chain of skilled health care workers, thus enabling the researcher to re-cast the healthcare worker shortage within a quantitative framework.

Becker (1964) has been credited for taking the concept of human capital theory beyond the monetary assumptions that originally made it a controversial subject (human beings as a commodity was a sensitive topic in the 1960s, which was less than a century after the Civil War). Becker described human capital as a science “concerned with activities that influence future monetary and psychic income by increasing the resources in people” (p. 11). He stated that an emphasis on the economic effects of education and its impact on human capital should not suggest that other, non-monetary effects are not important or less important. Becker’s approach to human capital was of critical significance in the current study as insight was sought regarding the demographics, employment histories, and decisions of community college health occupations’ graduates that could not easily be explained or defined by monetary factors. Variables that have an effect on the healthcare worker labor market and the decisions that the healthcare worker makes include

population demographics, health care utilization patterns, education and training opportunities, workplace environment, and the economy (Iowa Department of Public Health, 2003).

Analyzing the demographics and other characteristics of community college nursing and Allied Health program graduates is a useful exercise when the process is viewed as a study of the key factors in the human capital supply of healthcare workers. Identifying trends, outcomes, and themes about these graduates, where they are working, and how their work can impact the healthcare economy in Iowa and the nation.

Human capital theory differentiates between formal and informal education, or what Hlavna (1992) called “general” and “firm-specific” training. This education is defined as “a finite set of resources to be allocated among an infinite number of wants” (p. 2). Skilled healthcare professionals graduating from community college programs are faced with many decisions as to where, when, and how they choose to practice their professions. While a certain amount of training and education will be “on-the-job” or informal learning (Livingstone, 1997), community colleges will play a major role in the formal training of healthcare professionals.

Community colleges are involved in both general and firm-specific training as identified by Hlavna (1992). Therefore, community colleges play an important role in the formal development of human capital, given their close associations with business and industry, their geographical proximity to the constituents they serve, and their ability to create and modify content to meet the needs of students and the healthcare industry (Laanan et al., 2006b).

An example of the close relationship that community colleges share with local business and industry is evident in the Iowa Industrial New Jobs Training Program (260E) and the Iowa Jobs Training Program (260F). These programs enable community colleges to provide cost-effective training and education to existing businesses as well as businesses new to Iowa. Training can be customized for an individual business. Through these two programs Iowa provides economic incentives to qualifying businesses to train new employees (The Iowa Industrial New Jobs Training Act, Iowa Code 260E), as well as re-train and provide enhanced training for existing workforce (Iowa Code 260F). Community colleges administer the programs by issuing federally tax-exempt and taxable training certificates on behalf of businesses. Proceeds from the sale of these certificates are used to reimburse companies for the training expenses that result from the creation of new jobs.

The 260F program is funded annually through state appropriations. Employers apply for training funds under this program and awards are usually in the form of a grant or forgivable loan. Community colleges administer both programs. Principle and interest payments are made using new job credits. Employers earn and deduct these job credits from their state withholding obligations and use them to for employee education/training at community colleges.

Community colleges provide general training through the applied and technical training and degree programs they offer. Programs that teach computer programming, industrial technology, business and accounting, and healthcare skills supply Iowa with workers with technical expertise which enable business and industry to obtain skilled professionals who have been trained to provide technical

expertise and knowledge that are not specific to one employer or business. As a result, community colleges help create and deliver a highly desirable commodity in a competitive economic environment wherein the demand currently exceeds the supply. With multiple employers vying for a small pool of skilled healthcare workers, there is a risk that employers and communities that are at an economic disadvantage will not be able to compete and suffer net losses in an aggressive labor market.

Research Questions

The following research questions guided this study:

1. What are the background characteristics of Iowa community college students who completed nursing and Allied Health education programs in the 2002 academic year? This includes the age, gender, race/ethnicity, and credential awarded.
2. What types of nursing and Allied Health programs did Iowa community college students complete in AY 2002?
3. What are the distributions among Iowa community college students who completed nursing and Allied Health programs employed in Medically Underserved Areas (MUAs), Medically Underserved Populations (MUPs), and Health Professional Shortage Areas (HPSAs)?
4. What are the postcollege annual median earnings of Iowa community college students who enrolled in nursing and Allied Health programs at Iowa's community colleges?
5. Are there statistically significant differences among the following groups in post-college earnings and do post-college earnings influence whether or not

nursing and Allied Health students work in MUAs, MUPs, and Health Professional Shortage Areas (HPSAs)?

a. Completers who work in MUAs/MUPs/HPSAs

b. Completers who do not work in MUAs/MUPs/HPSAs

Significance of the Study

Iowa's comprehensive community colleges play a crucial role in meeting the needs of Iowa's healthcare workforce. Their flexibility in content development and delivery, combined with their mission to meet the education needs of all Iowans, places Iowa's community colleges in a unique position to address the healthcare needs of the state. This study provides an in-depth analysis of the ability of Iowa's community colleges to meet the need for healthcare workers in Iowa. It also analyzes the trends, and provides demographic and geographic characteristics of healthcare professionals trained at Iowa's 15 community colleges. Knowing who is most effectively served by community college nursing and Allied Health programs will enable researchers and postsecondary education decision-makers to gain a better understanding of the audiences that need to be reached as well as the population that is under-represented in community college health education programs. [Lots of changes to this last sentence—think positively!]

Gaining a thorough and comprehensive analysis of these graduates and their employment decisions will help decision-makers to shape education and healthcare policy in Iowa. As state and federal dollars for public education become scarcer, and public and private institutions compete for students and the funding that follows

them, it is incumbent upon all institutions to make a concerted effort to target the areas of greatest need and the populations with the greatest yet unexploited potential. In addition, the knowledge gained from a study such as this will also enable educators to better understand the needs of their students, their potential students, and the communities they serve.

Definition of Terms

The following terms were defined for use in the study:

Academic Year: August through July.

Allied Health: Clinical healthcare professions distinct from nursing and medicine (physician). Allied Health professions include a broad range of skilled and technical professions involving the delivery of patient care.

Associates of Applied Sciences (AAS) Degree: Post-secondary degree from a two-year college with an emphasis on job-specific or technical skills.

Associate of Arts (AA)/ Associate of Science (AS) Degree: A post-secondary degree issued to a person who has satisfied the curricular requirements of the content equivalent to a two-year college parallel curriculum.

Baby Boom Generation: Residents of the United States born after the end of the Second World War but before 1965.

Cancer: Malignant formation of tissues marked by the uncontrolled growth of cells, often with the invasion of healthy tissues locally or throughout the body (Venes, 2001).

Career and Technical Education (CTE): Programs that prepare students for specific occupations at the pre-baccalaureate level. Usually this is an associate degree, diploma, or certificate program.

Career Cluster: A system of grouping educational programs into 16 clusters for the purposes of integrating academic and occupational skills. The system was developed by the National Association of State Directors of Career and Technical Education Consortium. The clusters are: (1) Agriculture and Natural Resources; (2) Construction; (3)] Manufacturing; (4) Logistics, Transportation and Distribution Services; (5) Information Technology Services; (6) Wholesale/Retail Sales and Services; (7) Financial Services; (8) Hospitality and Tourism; (9) Business and Administrative Services; (10) Health Services; (11) Human Services; (12) Arts and Communication Services; (13) Legal and Protective Services; (14) Scientific, Technical, and Engineering Services; (15) Education and Training Services; and (16) Public Administration/Government Services.

Classification of Instructional Program (CIP): A taxonomic scheme that supports the accurate tracking, assessment, and reporting of fields of study and program completions activity in postsecondary education (U.S. Department of Education).

Completer: Individual who has successfully completed a community college degree, diploma, certificate, or other credit program.

Contact Hour: Unit of time used in calculating college credit. One contact hour typically equals 50 – 60 minutes.

Certificate: An award issued by a college upon satisfactory completion of a course of study that is intended to award a diploma or degree.

Certification: A process by which knowledge or experience are affirmed for practitioners in a particular field. A declaration of specific competencies (Margolis, 2009).

Congestive Heart Failure: The inability of the heart to circulate blood effectively enough to meet the body's metabolic need (Venes, 2001).

Diploma: A post-secondary award whereby a student has satisfactorily completed a minimum of 15 semester hours with a general education component consisting of at least 3 semester hours from designated courses.

Diabetes Mellitus: A disorder of inadequate insulin activity, due either to inadequate production of insulin or to a decreased responsiveness of body cells to insulin (Bledsoe, 2007).

Fiscal Year: July 1 though June 30.

Health Disparities: "(D)ifferences in health patterns, such as incidence, prevalence, mortality, burden of disease, and other adverse conditions that occur among specific population groups" (The Iowa Department of Public Health, 2003).

Health Care Worker: An individual employed in a healthcare setting where some or all of the work involves skilled patient care.

Health Professional Shortage Area (HPSA): Geographic area, population group or facility (prison) where the population to full-time-equivalent primary care physician ratio is at least 3,500:1 (HRSA, 2007).

Leaver: Individual who at some point self-identified as nursing or Allied Health student at a community college but did not receive a degree, diploma or certification in the 2002 academic year.

Licensed Practical Nurse: Nurse who provides general care to patients in a clinical setting while operating under the supervision of a registered nurse or physician. Length of training is shorter that a register nurse, and clinical practice and procedures are limited.

Licensure: Process by which a government agency grants a time-limited permission to an individual to engage in a given occupation or activity after verifying that predetermined standards have been met (Margolis, 2009).

Medically Underserved Area (MUA): Counties or groups of contiguous counties, a group of county or civil divisions, or a group of urban census tracts in which the residing population has a shortage of adequate personal health services (HRSA, 2007).

Medically Underserved Population (MUP): Groups of persons who face economic, cultural, or linguistic barriers to healthcare (HRSA, 2007).

Primary Care Provider: A physician who provides initial medical evaluation and treatment for a person with an undiagnosed health concern as well as continuing care of other various medical conditions.

Registered Nurse (RN): A nurse who has graduated from a school of nursing, has passed the State Board Test Pool Examination, and is granted the right to practice (Clayton, 2006).

Limitations and Delimitations

The study used existing secondary data sources and was limited due to the nature of these datasets. The data were drawn from a dataset specific to Iowa's 15

community colleges and the healthcare industry in Iowa. While it is possible that implications and results could be extrapolated to other states (especially states that border Iowa), the study was not intended to be generalized beyond Iowa.

The data did not offer an evaluation of the quality of the Allied Health programs at the 15 community colleges or the competency or skill level of those individuals who complete the programs. The assumption was made that the training a student received at one community college was equivalent to that which another student completing the same program at that same school or a different school had received. While it is likely that differences do exist among schools, it was not within the scope or the study to evaluate individual programs or evaluate the quality of education received at the individual institutions.

Unemployment insurance (UI) data had limitations as well. The data did not account for factors such as full versus part time employment or where the person is employed if the employer has more than one geographic location in Iowa. Data did not include a description of the type of work in which the employer is engaged; that information was gathered based on the name of the company or data on commercial websites or other materials.

A significant delimitation to this study was that, in order to be included in the UI dataset that was analyzed, a nursing or Allied Health program completer had to be employed at least four consecutive quarters during one or more of the fiscal years that were studied. Individuals who worked three of fewer quarters were not included in the data analysis.

The study was further delimited in that it focused on for-credit nursing and Allied Health programs offered by Iowa's 15 community colleges that had recognized Classification and Instructional Program (CIP) codes attached to their discipline. Students were identified and included in the study based on the successful completion of a program of study. While some descriptive statistical data were gathered and analyzed on all students in 2002 who were enrolled in a community college nursing or Allied Health program (based on the CIP number of the students' declared major or program of study), the majority of this study looked at students in the 2002 cohort who were awarded a certificate, diploma or degree in one of the identified nursing or Allied Health programs.

Table 1.2 lists each program and its CIP number. This information was taken directly from the 2002 Management Information System (MIS) Data Dictionary. Although more current versions of the dictionary exist, the dataset analyzed was based on 2002 programs. While there have been minor changes to the terminology and nomenclature in the intervening years, no relevant programmatic changes have occurred that necessitate a re-consideration of the 2002 data as collected and analyzed.

It was recognized early in the study that some of the community colleges in the study offered certain Allied Health programs for non-credit education while other institutions offered the same course or series of courses for college credit. Phlebotomy and Pharmacy Technician are two such examples. Many individuals enrolling in these relatively brief certification programs (60-90 contact hours) are seeking training that will enable them to be employable within a brief period of time.

These students frequently have no desire to enroll in a college credit program and, typically, the successful completion of such a college program is not a prerequisite for employment. Based on the capabilities of the MIS dataset, the researcher decided to delete non-credit Allied Health programs in the study. All nursing programs offered by the community colleges were credit programs and, therefore, not affected by this delimitation.

Another limitation to the data was that there was a degree of variability among the 15 colleges regarding the type of credential a student might receive upon completion of the nursing or Allied Health program of study. While one college may offer a program such as Medical Assisting or Health Information Technology (HIT) as a two-year Associate of Applied Science (AAS) degree, another college may offer the same education and award a diploma or certificate rather than a degree. This was not a significant factor in the analysis of the data since the curriculum was generally consistent among the community colleges; all completers, regardless of credential awarded, were eligible to sit for the same licensure or certification exam and, ultimately, could be employed in the field. Certain areas of study such as nursing, respirator therapy, dental hygiene, and the therapy assistant programs were uniform among the 15 colleges in their requirement of a two-year AAS degree.

The study was further delimited in that Career Academy programs were not included in the analysis. Individuals in these programs are high school students and typically are not entering the workforce for career purposes following successful completion of the course or program of study.

Summary

Iowa's 15 comprehensive community colleges play a vital role in meeting the need for skilled healthcare workers in the state. Community colleges are able to respond quickly to changes in technology and workforce demands by offering programs and education for training, re-training, and continuing education for a variety of health professionals. Community colleges offer training that is specific enough to meet the needs of the communities they serve. At the same time, they provide the knowledge and skill sets to enable program completers a great variety of choices regarding employment in the field.

This study addressed the lack of knowledge regarding the extent to which Iowa community colleges have an impact on the current and impending healthcare worker shortage in the state. The study also sought to gather demographic data regarding community college career health education programs. Thus, a quantitative analysis was conducted to gather specific data regarding graduates of Iowa's community college career health programs to identify impacts and trends, and make recommendations for future policy that address and potentially meet the needs of the state's healthcare community.

Of particular interest in this study was the contribution Iowa's community colleges has had on supplying nursing and other Allied Health professionals to areas of the state where the need is the greatest. An analysis of federally designated Medically Underserved Areas (MUAs) and Medically Underserved Populations (MUPs) as well as federal Health Professional Shortage Areas (HPSAs) and the migration of community college nursing and Allied Health program completers may

provide decision-makers with valuable predictive insight into the employment and staffing patterns in MUAs, MUPs, and HPSAs. A quantitative analysis of the employment decisions and wages of these program completers may also provide information that can inform future healthcare and healthcare education policy.

CHAPTER 2. REVIEW OF LITERATURE

The review of the literature relevant to this study focuses on four themes. The first theme is the healthcare worker shortage in the nation and in Iowa. The literature review covers the demographic changes currently taking place and their impact on healthcare, healthcare education, and the healthcare workforce. The second theme is the community college as a participant in the development and delivery of healthcare education. The literature review addresses the history of the comprehensive community college, specifically how community colleges serve a need in the training of skilled healthcare workers and the placement of these students into the Iowa workforce. Discussed next are the medically underserved communities in Iowa and the challenges faced by Iowa's medically underserved healthcare population. This section lays the groundwork for the discussion in future chapters regarding the extent community colleges are serving these communities in the training and placement of trained healthcare professional. The final section focuses on human capital theory, and how the supply and demand of skilled healthcare workers in Iowa can be described and analyzed within the context of this model of economic theory and human behavioral science.

Healthcare Worker Shortage

A potential healthcare crisis exists as the nation's Baby Boom Generation ages, and requires more and more healthcare assets and infrastructure. From 1970 to 2002, healthcare consumption as a percentage of the country's Gross Domestic

Product (GDP) doubled from 7% to more than 14%. This consumption is estimated to rise to 17% by 2011 (Iowa Department of Public Health, 2003).

The Federal Bureau of Labor Statistics estimated that employment in healthcare occupations will exceed 14 million jobs by 2011, an increase of 3 million jobs from 2000 figures (Bureau of Labor Statistics, 2004). During this period of time the growth rate for new jobs in the healthcare industry is expected to rise more than 28%. In January of 2009, the Iowa Workforce Development division of the Iowa Department of Labor listed the unemployment rate in Iowa at 4.6%. During this same period the unemployment rate in the Health Services career cluster was 0.4% (Iowa Workforce Development, 2009).

By 2010, more than five million workers will be needed to take the place of individuals who are retiring from or leaving the healthcare workforce, or fill the new positions that have been created. Among the 30 fastest growing occupations in the nation are health care-related jobs, which account for 15 of those positions (Center for Health Workforce Studies, 2002). Table 2.1 illustrates the fastest growing health occupations from 2000 to 2012. It is significant to note that training for 10 of the 13 positions is currently offered through Iowa's community colleges.

The Bureau of Labor Statistics also tracks jobs that it considers as having the potential for rapid growth. In particular, the health occupations tracked by the Bureau of Labor Statistics are identified in Table 2.2. A job that grows "much faster than average" is expected to increase more than 36%; "faster than average" translated to growth of 21 to 35%; and "about as fast as average is 10 to 20%" (Bureau of Labor

Table 2.1. Fastest growing health occupations from 2000 to 2012

Occupation	Employment		Increase	
	2002	2012	Number	Percent
Medical Assistant	365,000	579,000	215,000	59
Physician Assistant	63,000	94,000	31,000	49
Home Health Aide	580,000	859,000	279,000	48
Health Information	147,000	216,000	69,000	47
Physical Therapy Aide	37,000	54,000	17,000	43
Dental Hygienist	148,000	212,000	64,000	43
Occupational Therapy Aide	8,000	12,000	4,000	43
Dental Assistant	266,000	379,000	113,000	42
Personal Care Aide	608,000	854,000	246,000	40
Occupational Therapy Assistant	18,000	26,000	7,000	39
Physical Therapist	137,000	185,000	48,000	35
Occupational Therapist	82,000	110,000	29,000	35
Respiratory Therapist	86,000	116,000	30,000	35

Source: Bureau of Labor Statistics, 2004.

Table 2.2. Health care job growth outlook, 2001-2012

Professional occupation	Expected rate of growth
Dental Hygienist	Much faster than average
Health Information Technologist	Much faster than average
Registered Nurse	Faster than average
Respiratory Therapist	Faster than average
Cardiovascular Technician	Faster than average
Diagnostic Medical Sonographer	Faster than average
EMT/Paramedic	Faster than average
Licensed Practical Nurse	Faster than average
Nuclear Medicine Technician	Faster than average
Pharmacy Technician	Faster than average
Radiological Technician	Faster than average
Surgical Technician	Faster than average
Clinical Laboratory Technician	About as fast as average

Source: Bureau of Labor Statistics, 2004-2005.

Statistics, 2004). Each of the positions listed is within the purview of the comprehensive community college.

In Iowa, the overall population is projected to increase by 3% between 2000 and 2020 (National Center for Health Workforce Analysis, 2000). Iowa has the nation's third highest percentage of residents over age 65, the second highest percentage of those over 75 years old, and the highest percentage of citizens 85 years of age and older (U.S. Census Bureau, 2003).

As the state's population continues to age and increase, there will be a need for an increase in healthcare personnel and infrastructure. The Iowa Department of Public Health (2005) predicted that, from 1998 to 2009, health services would be one of Iowa's largest industries for job creation, with more than 23,000 new positions created during this time period. A study commissioned by the Iowa Hospital Association (Norris, 2006) estimated that the health sector has an annual impact of $9.5 billion dollars in the state, with more than 137,000 Iowans either directly or indirectly employed in the health care sector (indirectly is defined as a healthcare-related position without patient contact). This is estimated to be approximately one-fifth (21%) of Iowa's workforce (Norris).

In order for the state to address the shortage of skilled healthcare professionals, an analysis of the number of existing resources should be referenced as a baseline from which to measure improvement and growth. Table 2.3 shows the number of health care professions in Iowa that are tracked by a state agency or bureau. The positions of perceived greatest need in 2005 were Registered Nurse (38,137; approximately 2/5th) followed by Certified Nursing Assistant (18,570;

Table 2.3. Iowa healthcare workers, 2003

Healthcare worker	Statewide count
Certified Nursing Assistant	18,570
Dental Assistent	4,045
Dental Hygiënist	1,488
Dentist	1,844
Dietician	797
Funeral Director	761
Family Therapist	145
Massage Therapist	1,757
Mental Health Counselor	450
Licensed Practical Nurse	9,622
Nursing Home Administrators	625
Occupation Therapist	686
Occupational Therapy Assistant	328
Optometrist	450
Pharmacist	4,830
Psychologist	421
Physical Therapist	1,323
Physical Therapy Assistant	560
Physician	9,776
Physician Assistant	583
Registered Nurse	38,137
Respiratory Therapist	1,084
Social Worker	4,241
Total	102,523

Source: U.S. Department of Labor, Bureau of Labor Statistics 2004-2005 (2007).

approximately 1/5th). Of the 23 occupations listed, training for 12 occurs at Iowa's community colleges. In 20 of the 23 healthcare professions listed, workers obtain some or all of their continuing professional education at community colleges.

Finally, in a study published in 2005 by the Iowa Department of Public Health's Center for Health Workforce Planning (Table 2.4), of the 24 professional

Table 2.4. Iowa health professions: Percentage of licensees age 55 & older

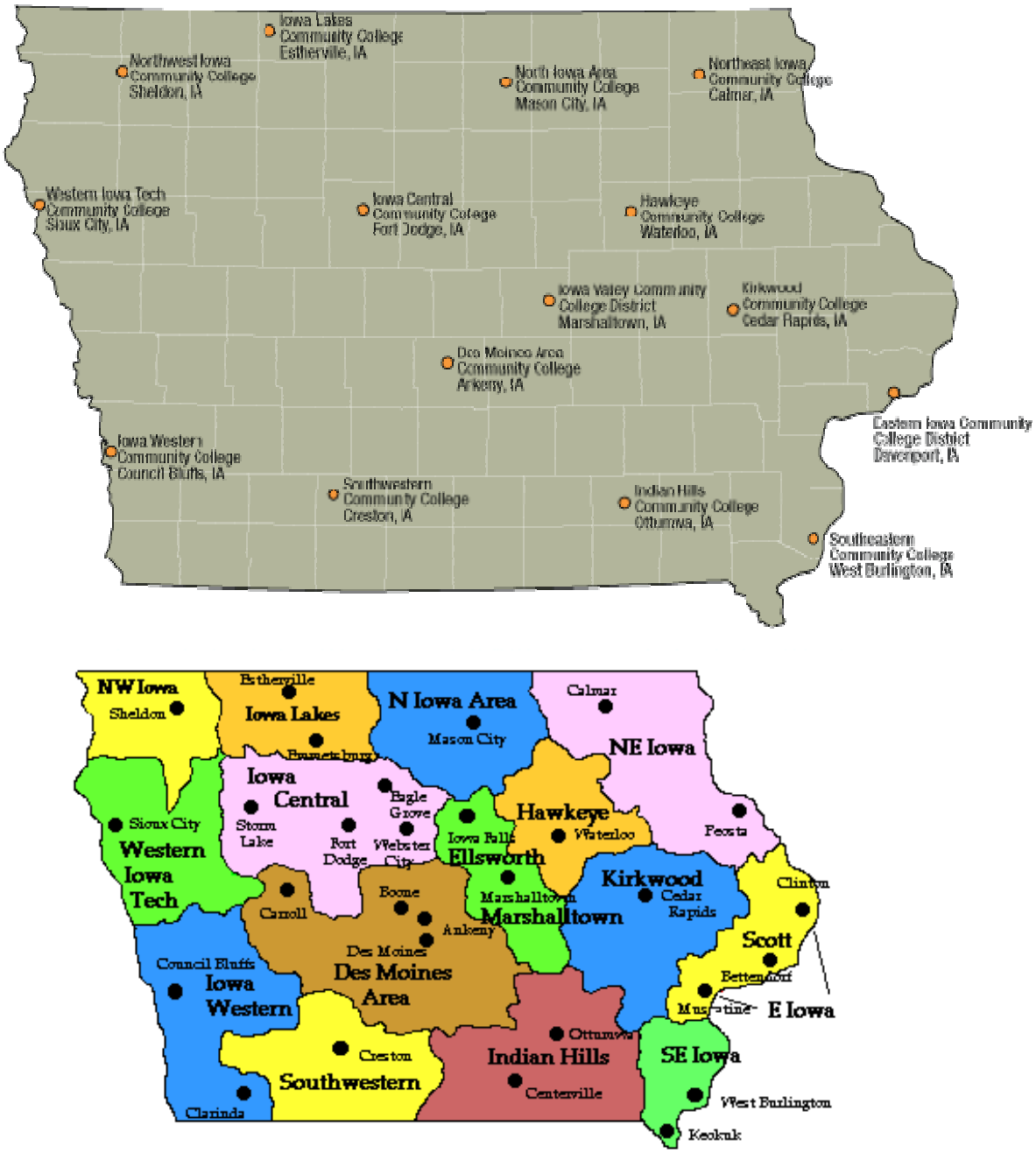
	Licensees		
		Age 55 & older	
Profession*	Total (*N*)	*n*	Percentage
Psychologists	460	215	47%
Health Service Providers	291	130	45%
Marital and Family Therapists	148	56	38%
Nursing Home Administrators	666	256	38%
Mental Health Physicians	322	113	35%
Mental Health Counselors	498	170	34%
Dentists	1,560	527	34%
Social Workers	4,331	1,192	28%
Advanced Nurse Practitioners	1,219	295	24%
Physicians	2,407	554	23%
Registered Nurses*	34,666	8,040	23%
Chiropractors	1,354	296	22%
Licensed Practical Nurses*	9,208	2,058	22%
Optometrists	571	125	22%
Pharmacists	2,529	547	22%
Dietitians	823	148	18%
Podiatrists	291	51	18%
Audiologists	242	38	15%
Speech Pathologists	709	109	16%
Respiratory Care Practitioners*	1,246	166	15%
Emergency Medical Services*	12,685	1,346	11%
Physicians Assistants	673	72	11%
Physical Therapists	2,484	234	9%
Occupational Therapists	1,197	67	6%
Total	80,579	16,805	21% (average)

*Community college educated; Source: Iowa Department of Public Health (2005).

licenses that are tracked by the state government, several professions had projected that more than 20% of their licensees were age 55 or older. As these licensees are nearing retirement, new professionals will need educated/trained to replace them.

Community Colleges as Providers of Healthcare Education

Iowa's first two-year community college was established in Mason City in 1918. In 1927 the Iowa General Assembly passed the first law authorizing the establishment of two-year public colleges. Between 1918 and 1953, junior colleges (as they were first called) operated as elements of local school districts. As the demand for post-secondary education began to grow following World War Two these two-year colleges saw rapid rises in enrollment. Between 1955 and 1965, enrollment in community colleges quadrupled (Iowa Department of Education, 1992). The state's comprehensive community college system as it exists today was formally established in 1965, when the state legislature enacted the law that permitted the creation and formal recognition of a system of two-year postsecondary schools in what were to be called "merged area schools". These merged schools had their roots in area high school vocational and technical programs but were also charged with creating a pathway to four-year postsecondary schools. In 1966, 14 community colleges were created and organized. In 1967, the 15th community college was established. Today these 15 community colleges operate 28 major campuses across Iowa. A geographical representation of these colleges is shown in Figure 2.1. Table 2.5 provides a list of these colleges and the areas they serve.



Source Iowa Department of Education, 2008.

Figure 2.1. Location of Iowa's 15 community colleges

Table 2.5. Iowa community colleges and areas served

College	Location
Northeast Iowa Community College	Calmar, Iowa (Area I)
North Iowa Area Community College	Mason City, Iowa (Area II)
Iowa Lakes Community College	Estherville, Iowa (Area III)
Northwest Iowa Community College	Sheldon, Iowa (Area IV)
Iowa Central Community College	Fort Dodge, Iowa (Area V)
Iowa Valley Community College	Marshalltown, Iowa (Area VI)
Hawkeye Community College	Waterloo, Iowa (Area VII)
Eastern Iowa Community College District	Davenport, Iowa (Area IX)
Kirkwood Community College	Cedar Rapids, Iowa (Area X)
Des Moines Area Community College	Ankeny, Iowa (Area XI)
Western Iowa Tech Community College	Sioux City, Iowa (Area XII)
Iowa Western Community College	Council Bluffs, Iowa (Area XIII)
Southwestern Community College	Creston, Iowa (Area XIV)
Indian Hills Community College	Ottumwa, Iowa (Area XV)
Southeastern Community College	West Burlington, Iowa (Area XVI)

The mandate for the creation and continuing mission of a comprehensive community college system is found in the Code of Iowa, Chapter 280A.1. In this chapter of the code, the purposes or charges of the community college system were delineated to vocational and technical training and “training, retraining, and all necessary preparation for productive employment of all citizens” (Iowa Department of Education, 1992, p. 37).

Community colleges have open enrollment policies. Historically, they have accepted all people wishing to continue their education beyond high school, or develop career and technical skills to begin a new career, or upgrade an existing one. This open enrollment policy has enabled those who might not have the opportunity for postsecondary education to pursue higher education and training.

Today, the mission of educating all interested individuals in career and technical skills remains a key element of the community college system.

In 2006, 35.6% of students enrolled in community college credit courses were enrolled in career and technical programs (Iowa Department of Education, 2007). Between 2001 and 2006, the percentage of students enrolled in Health Occupations programs within Iowa's 15 community colleges has steadily increased. Table 2.6 lists the percentage of students in health programs based on a comparison of credit students, and Career and Technical Education (CTE) students.

The American Association of Community Colleges (AACC, 2004) revealed that 30% of students enrolled in career and technical programs at community colleges nationwide were training for careers in healthcare. The education of skilled healthcare workers has not been the exclusive purview of community colleges; however, these two-year public institutions provide career and technical training

Table 2.6. Percentage of students in health education programs in Iowa community colleges

	Percentage of students	
Year	Credit	Career & Technical Education (CTE)
2001	11.0	(data not provided)
2002	12.8	(data not provided)
2003	14.4	(data not provided)
2004	15.0	(data not provided)
2005	15.1	35.69
2006	14.4	35.65
2007	13.8	34.3

Source: Iowa Community College Credit Student Enrollment reports, 2001-2007.

for a large and diverse population of primary care and support personnel. The individual programs at community college achieve rigor and high academic standards through challenging curriculum and a solid foundation of prerequisite courses. The open access mission of community colleges, combined with the geographic diversity and representation across the state, ensures that all learners are afforded the opportunity for education and, as a result, all areas of the state benefit from this skilled workforce.

While four-year and graduate postsecondary institutions educate and train physicians, physician assistants, and a number of the state's nurses, community colleges in Iowa offer credit and non-credit education and training for 39 health care disciplines. Table 2.7 provides a matrix illustrating which programs are offered at each of Iowa's 15 community colleges.

Community colleges have financial characteristics that make them uniquely qualified to educate the state's healthcare workforce. Community colleges offer students a very high return on their education investment. A 2003 study of the socioeconomic benefits of attending an Iowa community college revealed that Iowa taxpayers realize an annual return of 9.5% on their investment in community colleges and the average student sees an additional $107 in wage increases yearly for each credit they complete (Laanan et al., 2006a). Factoring into this is the low cost of a college education received at a community college. In the 2008-2009 academic year, the annual fulltime (15 semester hours) tuition rate at Iowa community colleges averaged $3,390. This low cost can be compared to an average

Table 2.7. Nursing and Allied Health programs offered at Iowa community colleges

	Northeast Iowa Community College	North Iowa Area Community College	Iowa Lakes Community College	Northwest Iowa Community College	Iowa Central Community College	Iowa Valley Community College	Hawkeye Community College	Eastern Iowa Community College	Kirkwood Community College	Des Moines Area Community College	Western Iowa Tech Community College	Iowa Western Community College	Southwestern Community College	Indian Hills Community College	Southeastern Community College
Chiropractic Assistant			X												
Dental Assisting	X					X	X	X	X	X	X	X			
Dental Hygiene							X		X	X	X	X			X
Dental Laboratory Technology									X						
Health Information Technology	X			X				X	X					X	
Health Information Transcription									X						
Medical Assisting		X	X		X				X	X	X	X			X
Occupational Therapy Assisting		X	X						X		X				
Pharmacy Assisting									X					X	
Physical Therapy Assisting		X	X					X	X		X			X	
Electroneuroencephagraph Technology								X	X						
Emergency Medical Technology- Paramedic	X	X			X			X			X	X			X
Emergency Medical Technician- Basic I	X	X	X	X	X			X	X	X	X				
Emergency Medical Technician- Intermediate		X			X			X			X			X	
EMT- Iowa Paramedic Specialist		X	X						X		X	X		X	
Radiologic Technology	X				X			X	X					X	X

Table 2.7. (Continued).

	Northeast Iowa Community College	North Iowa Area Community College	Iowa Lakes Community College	Northwest Iowa Community College	Iowa Central Community College	Iowa Valley Community College	Hawkeye Community College	Eastern Iowa Community College	Kirkwood Community College	Des Moines Area Community College	Western Iowa Tech Community College	Iowa Western Community College	Southwestern Community College	Indian Hills Community College	Southeastern Community College
Respiratory Therapy	X						X	X	X	X					X
Surgical Technology		X	X						X		X	X			
Diagnostic Medical Sonography								X							X
Magnetic Resonance Imaging (MRS)								X							X
Medical Laboratory Technology	X	X	X		X		X				X			X	
Phlebotomy									X	X					
Alcohol/Drug Abuse Specialty															X
Nursing, Associate Degree	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Practical Nursing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nursing Assistant		X			X		X		X	X	X			X	
Medical Secretary Specialist					X						X				
Medical Administrative Secretary Management*			X				X			X					
Medical Secretary-Transcription Management	X											X	X	X	
Total number of programs offered	**10**	**12**	**11**	**4**	**10**	**3**	**8**	**13**	**19**	**10**	**15**	**9**	**3**	**11**	**8**

Source: Iowa Department of Education, 2007.

of $5,532 per year at the three Regents institutions (Iowa Department of Education, 2008a).

Table 2.8 provides a historical summary of annual Iowa community college full-time resident tuition as compared to the state's three Regents' institutions. The table shows that, while gradually increasing over the years, the state average for full-time community college tuition has remained significantly less than that of the three Regents schools.

Community colleges are well-positioned to educate Iowa's new and existing healthcare workforce in that they offer flexible education in venues, settings, and delivery methods that accommodate all students—traditional and non-traditional. Community colleges provide career and technical training throughout the year in time-frames that go beyond the typical "two semesters and a summer" format of four-year schools. They also offer education and career training at the workplace, over fiber optic networks, and via web-based instruction at a level and degree of sophistication far beyond the tradition postsecondary institution. The 2004 *Faces of the Future* report on the community college student revealed that: "seventy-two percent of students who enrolled to upgrade skills and advance their careers indicated that community college had made a major contribution in their skills.

Table 2.8. Annual full-time tuition comparison rates

Institution	Fiscal Year									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Iowa Community Colleges	$1,856	$1,937	$2,162	$2,378	$2,571	$2,754	$2,916	$3,053	$3,199	$3,390
Iowa Regent Institutions	2,786	2906	3116	3,692	4,342	4,702	4,890	5,094	5,360	5,532

Source: 2007-2008 Academic Year, Iowa Community Colleges Tuition and Fees Report, issued July 2007.

required for their job" (AACC, 2004, p. 1). The same report stated community college students benefited from the institutions' "one-stop shopping" approach where services and help are accessible and readily available.

The agility and ability of Iowa's community colleges to respond quickly to changes in needs in healthcare education are the final components that make these institutions uniquely qualified to educate Iowa's healthcare workforce. Historically community colleges have enjoyed close working relationships with the businesses and industries in the communities in which they serve. In the *Journal of Partnership Perspectives,* Ottinger (1998) stated: "Community colleges must have their finger on the economic pulse of the community and respond appropriately. This responsiveness to changing workforce needs is crucial in today's healthcare environment" (p. 364). In Iowa, this collaboration includes community college partnerships with hospitals, physicians' offices, professional organizations, laboratories and other medical facilities, and a variety of assisted living and other skilled healthcare environments. These collaborations and partnerships enable community colleges to develop a vision and mission in the creation and delivery of healthcare education that articulates well with the community healthcare industry and is able to meet their changing needs.

Medically Underserved Communities in Iowa

Coinciding with the role community colleges play in providing education and training for a variety of healthcare professions to both traditional and non-traditional students, is their ability to help meet the needs of medically underserved and rural

communities and other areas where health disparities exist. The Institute of Medicine (2002) defined health disparities as "…differences in health patterns, such as incidence, prevalence, mortality, burden of disease, and other adverse conditions that occur among specific population groups" (n.p.). The Iowa Department of Public Health (2003) stated:

> Many factors influence the supply and demand of health workforce and need to be accounted for when planning to stem cyclical workforce shortages and surplus. Variables include population demographics, healthcare utilization patterns, education and training opportunities, workplace environment, and the health of the economy. (p. 1)

In 1976 the federal government established criteria for the designation of Health Population Shortage Areas (HPSAs), Medically Underserved Areas (MUAs), and Medically Underserved Populations (MUPs). These guidelines were published in Title 42 of the National Register and have served as the basis for determining areas where gaps in healthcare coverage exist (National Archives and Records Administration, 1976).

Medically Underserved Areas (MUAs) are defined as counties or groups of contiguous counties, a group of county or civil divisions, or a group of urban census tracts in which the residing population has a shortage of adequate personal health services (HRSA, 2007). Medically underserved populations (MUPs) are defined as groups of persons who face economic, cultural, or linguistic barriers to healthcare.

The MUA designation involves the application of a scale known as the Index of Medical Underservice (IMU) to information and data on the geographic area in question. The values for each of these variables are converted to a weighted value and a score is determined (U.S. Department of Health and Human Services, 2007).

The IMU scale ranges from 1 to 100, with a score of 62.0 or less meeting the qualification for MUA designation. The IMU designation looks at four variables: (a) ratio of primary care physicians per 1,000 population; (b) infant mortality rate; (c) percentage of the population with income at or below the poverty level; (d) and percentage of the population over the age of 65.

The federal government also identifies populations that are at risk to receive poor health care or no health care based on economic or cultural/linguistic access barriers. These medically underserved populations (MUPs) lack access to primary health care and are identified using the same computational steps as MUAs. The distinction is that the medical underservice is not geographic. The physician-to-resident ratio for MUPs reflects the number of physicians able to serve the particular demographic element rather than all the residents in a specified area. MUPs may reside in an MUA but will face additional barriers and challenges in access to healthcare (U.S. Department of Health and Human Services, 2007).

Finally, the United States Department of Health and Human Services, Health Resources and Service Administration (HRSA), identifies areas that lack a sufficient number of primary care physicians as primary medical care Health Professional Shortage Areas (HPSA). These areas are designated either by geographic area, population group, or the facilities available (U.S. Department of Health and Human Services, 2007). This lack of physicians results in a trickle down effect where insufficient physician presence results in a lack of related healthcare professions including nurses, technicians, and other skilled providers in the HPSA.

Geographic area HPSAs must either have a population to full-time-equivalent primary care physician ratio of at least 3,500:1, or have a population to FTE primary care physician ratio of 3,000:1 and have unusually high needs or insufficient capacity of existing primary care providers (U.S. Department of Health and Human Services, 2007). To qualify as a population group in an HPSA, the population must reside in an area that is rational for the delivery of primary care as defined in the Federal Code of Regulations, have access barriers that prevent the population from accessing the area's primary care providers, and have a ratio of qualifying population members to primary care provider of at least 3,500:1. Members of Native American tribes automatically qualify for this designation.

Finally, it is possible for a facility to be designated as a federal HPSA. This is most common with federal or state correctional facilities but also can occur in public and/or non-profit medical facilities that can demonstrate they provide medical services to an area or population group identified as above (U.S. Department of Health and Human Services, 2007). In 2008, there were 6,033 Primary Care HPSAs with 64 million people living in them (U.S. Department of Health and Human Services, 2007).

It has historically been the mission of community colleges to serve the individuals and institutions in the areas where they are located. A review of the geographic location of Iowa's 15 community colleges revealed that, in 2008, 13 community colleges (86.6%) were located in or bordering counties identified as medically underserved or ones where medically underserved populations reside (Iowa Department of Public Health, 2008).

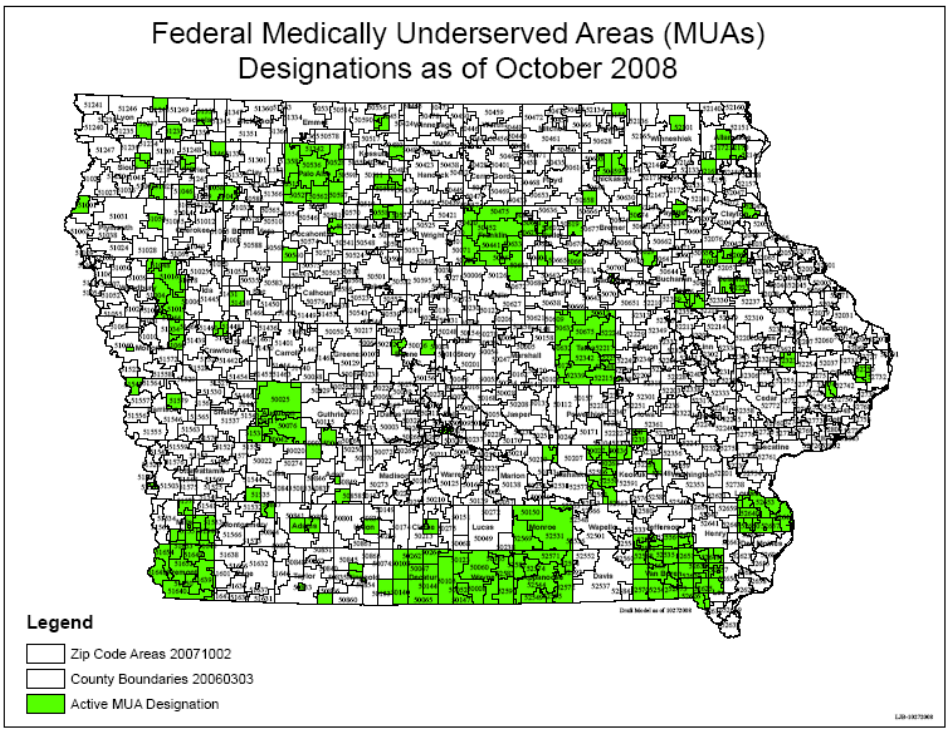
Table 2.9 shows the total number of counties, townships or MCDs, and census tracts that were classified as HPSAs, MUAs, and MUPs in 2008 (Iowa Department of Public Health. 2008). The data reveal that 30% of counties in Iowa are designated as HPSAs, 10% are MUAs and 6% as MUPs for an overall percentage of 46.6% of all Iowa counties identified as meeting at least one of the three healthcare shortage criteria, Similar percentages are evident in Townships/MCDs and census tracts.

Table 2.9. Number of Iowa counties, townships, and census tracts identified as MUAs, MUPs, and HPSAs (2008)

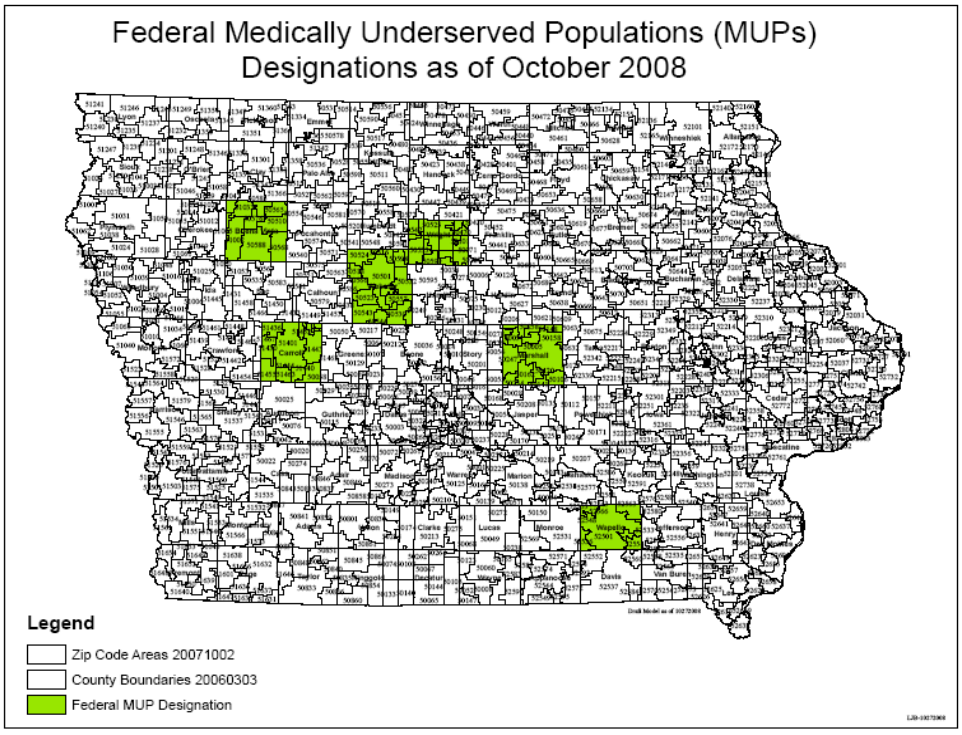
	Area					
	Health protection shortage		Medically underserved		Medically underserved population	
	designated	counties	designated	counties	designated	counties
Counties (*n*=99)	30	30	10	10	6	6
Townships/ MCDs (*n*=1,724)	111	14	97	33	12	1
Census Tracts (*n*=794)	11	1	37	7	9	1

Source: Iowa Department of Public Health Center for Health Workforce Planning, 2008.

The following three maps (Figure 2.2) illustrate the geographic areas of Iowa that are designated as federal medically underserved areas, medically underserved populations, and health professional shortage areas. There is some overlap noted among the three maps. This is explained by different criteria are used in designating MUAs, MUPs, and HPSAs. This results in some areas that can be designated as MUAs, MUPs and HPSAs. Health Population Shortage Areas are further categorized as either geographic or in terms of the income of the resident population.



Source: Iowa Department of Public Health Center for Health Workforce Planning, 2008.



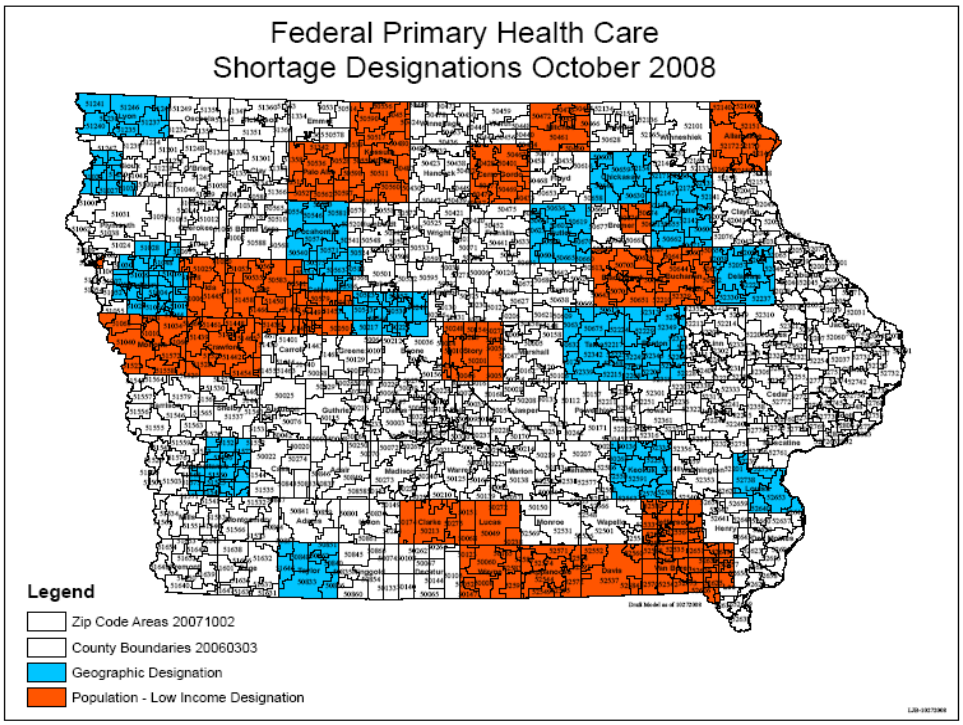


Figure 2.2. Federal medically underserved areas (MUAs), populations (MUPs), and primary healthcare shortage designations, 2008

One of the hallmarks of a community college education is its ability to meet the needs of individuals and industry in the area where the community college is located. Many area businesses rely heavily on community colleges for a workforce that is trained locally and, consequently, more likely to stay in the area. Iowa is primarily a rural state, with many of the community colleges located in or near rural areas. With community colleges serving students in at all geographic and socioeconomic levels, the mission of these community colleges has become one of providing the training and skills needed for the economic sustainability of all parts of Iowa, including rural and economically depressed areas.

Key to the success of healthcare education and a robust supply of skilled healthcare workers serving these areas is the synergistic relationship between community colleges and local healthcare business and industry (Iowa Department of Public Health, 2003). With healthcare generating over $9.5 billion dollars and creating one in five jobs in Iowa, the need is critical for training and re-training of skilled healthcare providers in all areas of the state.

In the Iowa Department of Public Health's 2005 report, *Building Iowa's Health Workforce 2004*, the authors stated: "Rural communities have demonstrated a unique capacity to respond to health workforce shortages and strengthen the viability of the workforce by providing training opportunities within the community to grow their own workforce" (p. 19). Essential to this "grow your own" philosophy is the education and training provided by Iowa's community colleges.

Human Capital Theory

Human capital theory is an economic approach to the evaluation of the cost and benefits of the investment in skills and knowledge (van Loo, 2004). Human capital theory is grounded in the assumption that an investment in the education and training of an individual is similar to the economic investment in buildings, equipment, technology, or other "physical capital" (van Loo). Human capital theory was first introduced in *Wealth of Nations* by Adam Smith (1776). In *Wealth of Nations,* Smith stated, "It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard for their own interest" (p.12). The theory was later refined and analyzed within the context of education by

Nobel laureate, Gary S. Becker (1964), in *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Educatio*n.

The benefit of using human capital theory to analyze Iowa's healthcare workforce supply needs and the ability of community colleges to address these issues is the ability of the theory to apply quantitative methodology to address concerns such as education and training (van Loo, 2004). When reduced to its basic components, Iowa's healthcare worker shortage is a case of supply and demand. The combination of retiring Baby Boom healthcare workers has increased in the numbers and average age of the state's population. Changes and advances in healthcare and healthcare technology have created an increased demand for skilled healthcare workers in Iowa. The supply of these skilled individuals is contingent upon their receipt of the appropriate education or training. Community colleges can be viewed as the "suppliers" of these workers and, as a result, there is great benefit in being able to understand how community colleges function in the supply chain and the impact they have in meeting this need.

One assumption underlying human capital theory is that there is a value to education and that more education often provides an increase in monetary compensation or return on investment (Becker, 1962). Human capital theory tends to equate the knowledge level of the worker with the level of formal schooling or training. It also assumes that those who exhibit higher learning capacities will be compensated at a greater rate than those whose positions require less knowledge and abilities (Livingstone, 1997).

In advanced industrial market economies individuals have a tendency to increase their relative value in the employment market by increasing their learning capacity through formalized education and training. An exception to this are the jobs or tasks that are less desirable or harder to fill. Healthcare workers tend to meet both these criteria, with many positions requiring a high tolerance for both physical and emotional stress and a great need for specialized formal education.

A study by Graf (2001) analyzed the career and education aspirations of associate degree graduate nurses who had gone on to pursue advanced nursing degrees, typically Bachelor of Science in Nursing (BSN) degrees. Using a framework of human capital theory to identify the factors that influenced these nurses to continue their formal nursing education, Graf concluded that the possibility of an increased return on investment was influential in convincing these nurses to pursue four year or higher degrees.

Historically, predicting and responding to the projected needs for a community's healthcare infrastructure has proven difficult:

> The size and characteristics of the future health workforce are determined by a complex integration of the health care operating environment, economic factors, technology, regulatory and legislative actions, epidemiological factors, the healthcare education system, and demographics. Efforts over the past several decades to model the supply of and the demand for healthcare workers show that there is a lack of consensus on the relationship between the health workforce and its determinants. (Health Resources and Services Administration, 2000)

The migration of human capital, particularly from areas of economic depression or poverty to areas of economic prosperity, is an aspect of human capital theory that further complicates this economic model and often leads to health disparities at all

levels of healthcare infrastructure. In 2000, almost 175 million people (2.9% of the world's total population) were estimated to be living outside their birth country. One third of those people were estimated to be actively involved in the economy of the foreign country (United Nation Population Division, 2002).

The migration of healthcare workers has mirrored this trend. While it has been difficult to capture quantitative data specific to the healthcare workers due to inconsistencies in definitions and reporting requirements (Stilwell et al., 2004), anecdotal evidence (Findlay, 2002; Martineau, Decker, & Bundred, 2002) suggests that skilled healthcare workers are leaving countries with low annual wages and poor healthcare infrastructure, and migrating to countries that are more economically prosperous and where better wages and job opportunities exist.

Research has also shown that, in most cases, the wage disparities are so significant that attempting to reduce them by small amounts would have little effect on this migration (Vujicic et al., 2004). Researchers agree that, when there are substantial wage differences among countries, the prospect of earning more income is a significant factor in the decision to migrate (Stalker, 2000; Xaba, 2001).

While the benefit of an investment in education has been studied in pure economic terms (Ayres, et al, 1996; Hlvana, 1992; Laanan et al., 2006a), human capital theory enables one to study this dynamic model from a variety of perspectives. Nonmarket compensation (Jorgenson, 2008), such as leisure time, quality of life, pace of work, philanthropic or altruistic motives and loyalty to one's hometown, all play a part in how healthcare workers graduating from Iowa community college programs make their decisions and contribute to meeting the

state's need for skilled healthcare providers. When speaking about human capital theory in his 1993 Nobel Lecture, Gary Becker stated, "The economic approach I refer to does not assume that individuals are motivated solely by selfishness or material gain" (p. 385).

While studies have shown that community college graduates realize a 23% return on their investment and are projected to see a cumulative $6.47 in higher discounted future earnings over their work life (Kasper, 2003), a more refined economic analysis may be able to provide a more detailed and descriptive picture of how and why healthcare workers educated at community colleges choose to work where they do. Horrigan (2004) studied this issue and concluded that the best possible solution may be to examine as many social, economic and other factors as possible and, from this perspective, develop a profile of how the labor market reacts and responds to the changes in the relative demand for and supply of healthcare workers.

Consistent with one of the key questions the researcher used to guide this study, is an economic framework that enables the analysis of the factors and influences that shape the decisions of the Iowa community college nursing or Allied Health program graduates as they decide where to work upon completion of their education. If factors other than financial rewards play into those decisions, then the decision to work in a MUA, MUP or HPSA may have more to do with other, less quantifiable factors.

Summary

A review of the pertinent literature reveals that a shortage of skilled healthcare workers in Iowa and across the nation is looming, and there are serious consequences to all levels of society. Historically, the underprivileged and populations with economic and educational barriers suffer most in times of crisis. In this case, the medically disadvantaged and underserved risk a decrease in access to healthcare services and infrastructure as the demand for skilled healthcare workers increases. By virtue of their geographic location and mission to provide education, training, and re-training to citizens throughout the state, the community colleges, are uniquely positioned to address this shortage and provide flexible, just-in-time training and education to fit the needs of their local community and throughout the state.

Providing a framework for discussion of the problem is the economic construct known as human capital theory. By framing the problem in the context of supply and demand, and by looking at education as a commodity that adds value to the individual healthcare worker, it is possible to understand the decisions that healthcare providers make in obtaining or furthering their education. Understanding the employment decisions and geographic intra and interstate migrations of this workforce as a group enables healthcare employers to focus recruitment, training and retention in ways that appeal to this in-demand segment of the workforce.

CHAPTER 3. METHODOLOGY

This chapter includes the methodological approach, data sources, sample, and data analysis procedures to be used in this study. This study used descriptive and inferential statistics to understand the relationship between community college healthcare education program completers and their subsequent employment in Iowa's healthcare industry and its medically underserved areas and populations.

Methodological Approach

This study applied quantitative analysis using secondary data. It was assumed that, by analyzing a large enough sample, conclusions could be drawn about the larger population from which the sample was derived (Creswell, 2003). In this case, the goal was to analyze a sample of students who had successfully completed a credit health career program at one of Iowa's 15 community colleges in the 2001-2002 academic year, and their subsequent employment history in order to draw conclusions about the healthcare workforce in Iowa. The MIS dataset was comprised of data from 2002, and included all community college students who had successfully completed a credit degree, diploma, certificate, or "other" program in a nursing or Allied Health discipline. Analysis by researchers prior to this study delimited the data to individuals who, after completing a program, had not transferred to a four-year postsecondary institution or continued their education at the community college level after receiving their healthcare credential (Compton, 2008). This was accomplished using data from the National Student Clearinghouse (NSC), and was key to focusing the research on those community college

completers who had entered the fulltime workforce in Iowa after competing their program of study.

This data were collated and analyzed in combination with six years of unemployment insurance (UI) data from 2002-2007 for the same sample, using social security numbers to synthesize the data sets. Students who withdrew from school, did not complete a program, or changed to a non-health program or major were not included in the analysis of the data. The 2002 population was treated as the sample for the purpose of drawing conclusions and generalizations about Iowa community college students who successfully completed programs that trained or educated them in health-related disciplines.

Data Sources

Data were taken and analyzed from three sources for this study. The first source was the Iowa Department of Education (IDE) Management Information System (MIS) database, a statewide data collection system that was used to identify the enrollment information and characteristics of completers. The second data source was the Iowa Workforce Development (IWD) unemployment insurance (UI) data, which provided information on quarterly wages for 24 employment quarters for community college nursing and Allied Health program completers. The third source of data that informed the analysis of these two primary sources was the U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA) Shortage Designation mapping tools and website toolkit (U.S. Department of Health and Human Services, 2007). This public access website

provided a geographic mapping tool that identified Medically Underserved Areas (MUAs), Medically Underserved Populations (MUPs, and Health Professional Shortage Areas (HPSAs) in Iowa by county, region, and zip code.

In addition, the Iowa Department of Public Health, Center for Health Workforce Planning provided technical assistance in the mapping of MUAs, MUPs, and HPSAs by Iowa county and zip code, and data on the number of MUAs, MUPs and HPSAs in Iowa. While these data were provided by the state agency tasked with studying healthcare shortages in Iowa, it is important to note that classification and designation of populations and geographic areas in Iowa were conducted using federal formulae and guidelines. This was proven to be important when generalizing the study and identifying future research topics.

The MIS dataset from the Iowa Department of Education is a database of information on all students enrolled in Iowa community colleges. The data were compiled and reported by each of the 15 community colleges, and were sent to the Department of Education, Division of Community Colleges and Workforce Preparation. Data collected in the 2001-2002 school year included demographic information such as age, sex, race/ethnicity, program of study or major (as determined by CIP code), credential awarded, and the college from which it was awarded. This information is compiled and reported at the end of the academic year for students enrolled that year.

The Iowa Workforce development unemployment insurance (UI) data provided information on employment and income for 24 quarters after the students leave the community college, from 2003 to 2007. Information collected included

quarterly wages- defined as the sum of all wages for each job worked in each quarter and annual wages-the sum of all quarterly wages (Compton, 2008). Information in this dataset also included name and place of employer (including zip code), annual wage received, and dates of employment. Since the individual's social security number tracked both MIS and UI data, it was possible to coordinate and integrate the information from these two datasets. The UI data included the name of the employer and an industry code. They do not specify the individual's job responsibilities, nor do they correlate the position with the individual's training or education. This was a limitation of the data.

The unemployment insurance data were used to learn about employment history following the completion of a community college nursing or Allied health education program. The data that were analyzed started July 1, 2002 and concluded June 30 2007. Earnings information was analyzed beginning with the first year after the student completed his or her college program of study (July1, 2002-June 30, 2003), and was gathered for each fiscal year (July 1-June 30) ending in 2004, 2005, and 2007.

The UI data listed the address of the home office of the employer. In most cases, the employer address was unique to the geographic place of employment. In a several cases, particularly those involving nursing homes and residential care centers, the employer had multiple businesses located in different parts of the state. This was a limitation. To mitigate this, a proxy system was established whereby the employer's business address was cross referenced with the zip codes of the multiple locations listed for the employer on the business website.

From this information the geographic location of employment and whether or not that was a federally designated MUA, MUP, or HPSA was extrapolated. For example, if ABCM Corporation listed residential care centers in Allison, Garner, and Sigourney, Iowa, and had its headquarters in Hampton, then the zip codes of these locations were compared to the zip codes for federally designated Medically Underserved Areas, Medically Underserved Populations, and Health Professional Shortage Areas.

A close analysis of the addresses and zip codes revealed that only five of the employers (*n*=1427; 0.3%) had multiple locations within Iowa. This accounted for 150 of 4300 (3.4%) of all discreet UI data reports for all of the fiscal years studied. These employers are listed in Table 3.1. While it is possible that an employer's business headquarters may be in an MUA, MUP, or HPSA and a satellite location might not (or visa versa), the researcher did not perceive this was a large enough subset of the data to justify its removal.

The initial dataset from the MIS system included 95,349 students enrolled in Iowa's 15 comprehensive community colleges in the 2001-2002 academic year. This dataset was significantly delimited to students who were listed as having healthcare occupations as their major (as identified by CIP code) and had completed a credentialing program, typically an Associates of Applied Sciences degree, diploma, or certification at the end of the 2001-2002 academic year.

Table 3.1. Businesses in UI database with multiple geographic locations in Iowa

Business Name	Headquarters	Other Locations
Iowa Department of Veterans Affairs	Marshalltown (50158*)	Knoxville (50138), Iowa City (52240), Des Moines (50301), Bettendorf (52722), Dubuque (52001), Fort Dodge (50501*), Mason City (50401*), Sioux City (51101*), Spirit Lake (51360), Waterloo (50702*)
Millennium Therapy Rehab and Consulting	West Des Moines (50061)	Fort Dodge (50501*), Winterset (50273), Davenport (52806), Independence (50644*), Hudson (50643*), Edgewood (52042)
ABCM Corporation	Hampton (50441*)	Allison (50602*), Aplington (50604*), Armstrong (50514), Battle Creek (51006*), Belmond (50421*), Bloomfield (52537*), Britt (50423), Clear Lake (50428*), Des Moines (50316), Dumont (50625*), Elma (50628), Emmetsburg (50536*), Garner (50438), Guttenberg (52052*), Hampton (50441*), Independence (50644*), Indianola (50125), Lake Mills (50450), Mason City (50401), Morning Sun (52640*), Mount Vernon (52314), Nevada (50201*), Nora Springs (50458), Oelwein (50662*), Sac City (50583*), Sigourney (52591*), Waterloo (50703*), Waukon (52172*), Webster City (50595)
Cedar Valley Medical Specialists	Waterloo(50701*)	Waterloo (50702*, 50703*), Cedar Falls (50613*), Waverly (50677)
Young House Family Services	Burlington (52601)	Mount Pleasant (52641), Ottumwa (52501*)

*MUA/MUP/HPSA

Students who had not completed a program of study were excluded from this study. Students who were enrolled in dual-credit high school programs, or who enrolled in postsecondary education following the 2001-2002 academic year, were not included in the final sample of 1538.

Within this final sample a small subset was identified as having completed a community college degree, diploma, or certificate program but was not working in a healthcare-related field. Individuals who listed restaurants, retail stores, and other

obvious non-healthcare businesses as their employers were identified, but the decision was made to not remove them from the sample. A close review of all employers included in the UI dataset revealed that, of the 1,427 discreet employers listed, only 99 (6.9%) were not healthcare-related businesses.

The decision to leave these completers in the data that were analyzed was based on the premise that a healthcare credential was valuable and a student, upon completing a program of study, would in some way utilize that education. While it goes without saying that not all graduates will work in healthcare related fields, the assumption cannot be made that employment in a non-healthcare field means the individual is not utilizing his or her education. Certain professions, particularly the Emergency Medical Services, offer individuals the opportunity to volunteer their services. In 2008, 734 of the 881 EMS services (83.3%) in Iowa were either volunteers or minimally compensated, paid part-time employees (Iowa Department of Public Health, 2008). For this reason, the small subset of program completers were not removed from the data that were included in this study

Data Access and Security

The researcher accessed the MIS and UI data sources as part of a research project from the Iowa Department of Education Division of Community Colleges and Workforce Preparation in cooperation with the Office of Community College Research and Policy (OCCRP). This study was declared exempt from the requirements of the human subjects protections (45 46.101(b) (4)) by Iowa State University's Institutional Review Board, Office of Research Assurances (IRB ID #07-

374) (Appendix A). Since the data included social security numbers and other identifying education, access to the data was tightly controlled. Access to the data was ensured by an existing security plan that was in place at Iowa State University and had been approved by the Iowa Department of Education (Appendix B). Data were kept in an office that was locked when it was not occupied. The computer was password protected, and not connected to the college network or any other network. The computer was set up to automatically log off the user and enter standby mode after 15 minutes of inactivity.

Data Collection

Three primary sources of data were used in this study. The first source was the Iowa Department of Education Management Information System (MIS) database for community colleges. This is a data collection system administered by state and consists of college and student information submitted by community colleges annually. This data set provides year end demographic information for credit students enrolled in Iowa's 15 community colleges. While submission of this information to the state is not optional and funding depends on the colleges' timely and accurate data submission, the data are limited in that some students may choose to not answer certain questions when the data are collected. These data responses typically included race, gender, and age.

The second data source was the Iowa Workforce Development (IWD) unemployment insurance (UI) data that provided information on quarterly wages for 24 employment quarters. The MIS and the UI data were provided to the researchers

and Iowa State University by their respective agencies that maintain the data. The MIS data included year-end student enrollment files, and the UI data included the type of company or employer but did not specify the occupation or profession of the respondent. The MIS data came from a cohort of community college students enrolled in one of Iowa's 15 community colleges in the 2002 academic year.

These two data sources were merged by using social security numbers to match the Iowa Workforce Development UI data and the Iowa Department of Education MIS data. This combined sample was delimited by information from the National Student Clearing house, after removing those students who were enrolled in two- or four-year postsecondary institutions after July 2004. While approximately 2,800 institutions participated in this survey in 2003 (National Student Clearinghouse, 2008b), this dataset does not include all U.S. postsecondary institutions and is, therefore, a limitation to the data analysis (Compton, 2008).

The third data source came from the U.S. Department of Health and Human Services Health Resource and Service Administration Geospatial Data Warehouse (datawarehouse.hrsa.gov). The Health Resources and Services Administration (HRSA), is an agency of the U.S. Department of Health and Human Services (HHS). The HHS is the primary federal agency for improving access to health care services for people who are uninsured, isolated, or medically vulnerable. Comprising six bureaus, 13 offices and one center, HRSA provides leadership and financial support to health care providers in every state and U.S. territory.

The government open-access website, http://bhpr.hrsa.gov/shortage/ index.htm, contains a database that provides researchers and the lay-public with

statistics and demographic resources regarding Medically Underserved Areas, Medically Underserved Populations, and Health Professional Shortage Areas. Researchers are able to do keyword searches, and sort and analyze data by geographic location, income designation, and other relevant information. Areas are identified by date of designation, overall score on the Index of Medical Underservice (IMU), geographic designation (county, township, zip code) and type of designation (MUA, MUP, and/or HPSA).

Sample

The initial dataset from the MIS system included 95,349 students enrolled in Iowa's 15 comprehensive community colleges in the 2001-2002 academic year. From this initial cohort all individuals who were enrolled in a postsecondary institution in 2003 as identified by the National Student Clearinghouse (NSC) were removed. This dataset was then significantly delimited to 4636 students who listed healthcare occupations as their major (as identified by CIP code) and further delimited in the final analysis of the data to those 1538 who completed an associate's degree, certificate, diploma, or "other" at the end of the 2001-2002 academic year. Students who did not complete a program of study, who were enrolled in dual-credit high school programs, or who did enroll in postsecondary education following the 2001-2002 academic year, were not included in the final sample population.

Using the UI data, only individuals who worked all four quarters each fiscal year were included in the data analysis. While this significantly reduced the number

of completers included in the study, it provided a cohort of completers with similar earnings characteristics across the years that were studied.

Data Analysis Procedures

Descriptive and inferential statistics were used to analyze the data in this study. Data were analyzed using SPSS (version 15.0) software. The combined dataset consisted of information from the MIS, UI, and HHS datasets. The MIS and UI data were combined and correlated using student social security numbers. Using zip codes this combined dataset was then merged with HHS MUA/MUP/HPSA data to create one database with student demographics, income and employment history, and geographical information regarding work in medically underserved areas.

The earnings and income information was adjusted to the 2007 Consumer Price Index (Midwest Urban) in order to standardize income comparisons for all fiscal years (Compton, 2007). The 2007 consumer price index was adapted from the U.S. Department of Education, Bureau of Labor Statistics (BLS). Inflation adjusted earnings were defined by the equation $X((A-B)/B) + X = CPI$ adjusted earnings. In this equation, A represents the 2007 CPI factor and B represents the 2003, 2004, 2005, and 2006 CPI factors (U.S. Department of Labor, 2007).

Because the MIS and UI data included social security numbers, no student information or data were reported without first aggregating the data into at least ten cases. When it was not possible to aggregate the data, those cases were suppressed. A list of variables used in the study is provided in Table 3.2.

Table 3.2. List of variables used in the study

Variable	Description	Coding	Source
College	Community college where credential was awarded	1=Northeast Iowa CC 2= North Iowa Area CC 3= Iowa Lakes CC 4= Northwest Iowa CC 5= Iowa Central CC 6= Iowa Valley CC 7=Hawkeye CC 9= Eastern Iowa CC 10= Kirkwood CC 11= Des Moines Area CC 12= Western Iowa Tech CC 13= Iowa Western CC 14= Southwestern CC 15= Indian Hills CC 16= Southeastern CC	IDE Student year end student data file
Award Type	Credential awarded	1= AA (Associate of Arts) 2= AS (Associate of Science) 5= AAS (Associate of Applied Science 6= Diploma 7= Certificate 8= Other	IDE Student year end student data file
CIP Description	Classification of Instructional Program	Eight digit numerical code that identifies 39 nursing and Allied Health programs	IDE Student year end student data file
Gender	Gender	1= Male; 2= Female	IDE Student year end student data file
Race	Race/Ethnicity of individual	1= American Indian or Alaskan Native 2= Asian or Pacific Islander 3= Black 4= Hispanic 5= White 6= Chose not to reply	IDE Student year end student data file
Age	Age of student upon graduation based on date of birth	Continuous variable	IDE Student year end student data file
Award Yes/No	If student completed program	1= Yes; 2= No	IDE Student year end student data file
FY Wage Sum	Wages from fiscal years 2002, 2003, 2005, and 2007	The sum of all wages for each given year	IWD unemployment wage file data
Medical Flag	Whether or not employer is located in MUA/MUP/HPSA	0= does not work in MUA/MUP/HPSA 1= Does work in MUA/MUP/HPSA	HRSA shortage designation mapping database

Five research questions guided the study. The majority had several embedded questions.

Research Question 1

The first research question asked: *What are the background characteristics of Iowa community college students who enrolled in nursing and Allied Health programs?* Data and descriptive information that were studied included age, sex, race/ethnicity, degree, diploma, or certificate, award granted, college where credential was awarded, and type of program.

This question attempted to paint a portrait of the community college nursing and Allied Health program completer. This information was captured using descriptive statistics, laying the groundwork for inferential analysis of the program completers and their income and employment choices in the years following their graduation. Age, gender, race/ethnicity, and type of credential conferred all helped inform the analysis of the decisions these students made and the impact they had on the healthcare workforce in Iowa.

Research Question 2

The second research question asked: *What types of nursing and Allied Health programs did Iowa community college receive credentialing in?* These were determined by Iowa Classification of Instruction Program (CIP) number.

While closely aligning with Research Question 1, this question sought to identify the types of programs that students are completing. In Chapter 2, several professions and job classifications were identified as having a shortage of skilled

professionals or of being in danger of experiencing shortages. This question sought to show to what extent Iowa community colleges are meeting the demand for hard-to-fill positions and professions.

Research Question 3

The third research question asked: *What are the distributions among Iowa community college students who completed nursing and Allied Health programs employed in Medically Underserved Areas (MUAs), Medically Underserved Populations (MUPs), and Health Professional Shortage Areas (HPSAs)? Do graduates with certain credentials gravitate more towards or away from MUAs, MUPs, and HPSAs?*

This question used crosstabs and other descriptive statistics to identify within this combined dataset where community college program completers worked in the years following graduation. Iowa's 15 community colleges are located throughout the state and, by virtue of their mission, are tasked with serving all constituents seeking postsecondary training and education. This question attempted to discover the geographic employment patterns and histories of these program completers, specifically if they tend to migrate towards or away from Medically Underserved Areas. While human capital theory suggests that financial factors do motivate job seekers and that supply and demand dictate that hard-to-fill professions will be forced to compete for a limited pool of resources, the theory also holds that money and financial inducements are not the only factors guiding the employment decisions of workers (Jorgenson & Fraumeni, 1989). Before an inferential analysis of

healthcare workers and their employment choices could be undertaken, there must be a probe into the geographical employment patterns of these program completers.

Research Question 4

The fourth research question asked: *What were the postcollege annual median earnings of community college students who enrolled in nursing and Allied Health programs at Iowa's community colleges.* This question used crosstabs to look at the combined dataset in order to identify median incomes among different types of professions and areas of study and in terms of the type of credential conferred. Degrees, diplomas, and certificates make up the majority of credentials awarded (97%). In order to further analyze the data and the decisions these program completers made, it was important to analyze annual income in terms of the credential received and specific area of healthcare employment of the individual.

Research Question 5

The fifth research question asked: *Are there statistically significant differences among the following groups in post-college earnings and do post-college earnings influence whether or not nursing and allied healthy students work in MUAs, MUPs, and Health Professional Shortage Areas (HPSAs)?*

Completers who work in MUAs/MUPs/HPSAs

Completers who do not work in MUAs/MUPs/HPSAs

This question used inferential statistics to determine if there is a statistically significant difference in the median income of nursing and Allied Health program completers who worked with Medically Underserved Areas, Medically Underserved

Populations, or Health Professional Shortage Areas and those who did not. By using an independent sample *t*-test, this question analyzed the median earnings of nursing and Allied Health program completers for the years 2002, 2004, 2005, and 2007 to determine if there was a statistically significant difference between the two groups.

Limitations

The study used existing secondary data sources and, therefore, was limited due to the nature of these datasets. The data used were those specific to Iowa's 15 community colleges and the healthcare industry in Iowa. While it is possible that implications and results may be extrapolated to other states (especially states that border Iowa), the study was not intended to be used to generalize beyond its immediate context.

While providing information about those who have successfully completed health-related degree, diploma, or certificate programs, the data could and should not be used to evaluate of the quality of the nursing and Allied Health programs at the 15 community colleges or the competency or skill level of those individuals who completed the programs. It was assumed that successful completers of these programs had obtained the requisite skills and knowledge to function at the entry level in their chosen profession.

Unemployment insurance (UI) data also had limitations. They did not include information on those who graduated from Iowa community colleges and obtained work out of state. In addition, unemployment insurance data did not account for federal employees or those in military service. UI data do not reveal the type of job

the person has. The data reveal only the name of the employer and the type of work in which the employer is engaged. The employee's position was extrapolated from the degree or area of study information identified by CIP code. If a completer had received training as a nurse and was subsequently employed by a hospital or clinic, it was assumed that he or she was working as a nurse.

Another limitation to the data was that there was a degree of variability among the 15 colleges regarding the type of credential a student might receive upon completion of the nursing or Allied Health program of study. While one college may offer a program such as Medical Assisting or Health Information Technology (HIT) as a two-year Associate of Applied Science (AAS) degree, another college may offer the same education and award a diploma or certificate. This was not a significant factor in the analysis of the data since the curriculum was mutually agreed upon by the community colleges, and all completers, regardless of credential awarded, were eligible to sit for the same licensure or certification exam and, ultimately, could be employed in the field. Certain areas of study, such as nursing, respirator therapy, dental hygiene, and the therapy assistant programs, were uniform among the 15 colleges in their requirement of a two-year AAS degree.

Finally, if the employer had one or more geographic locations in the state, it was not always possible to identify where the person was employed. This limitation was mitigated to a large extent by an in-depth analysis of each employer with an attempt to assign proxy identifiers whenever possible as discussed previously in this chapter.

Delimitations

This study was conducted with several delimitations. The first delimitation was that the study included only those individuals who had completed recognized health-related career programs at Iowa's 15 community colleges as identified by CIP codes. Data were used from individuals who completed only credit nursing and Allied Health degree, diploma, or certificate programs. Students who enrolled in dual-enrollment high school programs, did not complete a program, or finished a health program but decided to continue their education at another postsecondary institution were not included in this study. Since the purpose of this study was to ascertain the outcomes of community college education on its students, and the healthcare sector and most occupations require a degree, diploma, or certification, there was no immediate benefit from including these other groups.

Another delimitation was that UI information was analyzed for the 24 quarters after the student had completed the program. While some students may have been employed in the healthcare workforce while in college, it was assumed for the purposes of this study that, until they had achieved the degree, diploma, or certification, they were not identifiable as a member of the trained healthcare workforce.

A third delimitation to the UI information was than only those individuals who worked for all four quarters of the fiscal year were included in that year's data report. While it was possible that relevant data could have been gleaned from those individuals who worked three or fewer quarters, this information was not gathered in the initial data acquisition and, thus, was not available.

It was recognized early in this research that some of the community colleges in the study offered certain Allied Health programs for non-credit education while other institutions offered the same course or series of courses for college credit. Phlebotomy and Pharmacy Technician are two such examples. Many individuals enrolling in these relatively brief certification programs (60-90 day) are looking for training that can make them employable in a brief period of time. These students often have no desire to enroll in a college credit program, and the successful completion of such a college program generally is not a prerequisite to employment. This was recognized early by the researcher, and, based on the capabilities of the MIS dataset, a decision was made to not include non-credit Allied Health in the study. All nursing programs offered by the community colleges were credit programs and did not factor into this delimitation.

Finally, this study was delimited in that Career Academy programs were not included in the analysis. These individuals were high school students and did not receive a college-level degree, diploma, certification, or other award upon completion of their program. They will not be entering the workforce for career purposes since the majority are still in high school.

Ethical Considerations

Ethical considerations centered on the sensitive nature of the secondary data and the use of social security numbers in the data set. Data were secure and access limited. Raw data were available on a dedicated computer workstation that was not connected to any network, either internal or external. This room was locked when

not occupied and the data on the computer were password-protected. Duplicates of raw data could not be created, and any information or data that left the office were in aggregate form and devoid of social security information or any other potentially identifying characteristics. This study was declared exempt from the requirements of the human subjects protections (45 46.101(b) (4)) by Iowa State University's Institutional Review Board, Office of Research Assurances (IRB ID #07-374). A copy of this document is shown in Appendix A.

Prior to being granted access to the database of sensitive material, the researcher signed an Affidavit of Nondisclosure, agreeing to not reveal any individual identifiable information or to disclose or publish any information where a sample unit or individual respondent could be identified. A copy of this affidavit is included in Appendix B. In the data analyses, all data with fewer than ten respondents were suppressed.

CHAPTER 4. RESULTS

This chapter includes results from the analysis of the MIS dataset, the combined MIS/UI datasets, and the demographic information from the HRSA Healthcare Shortage Designation database. The purpose of this study was to analyze the demographic and descriptive information of individuals who completed an Iowa community college degree, diploma, or certificate program in the 2001-2002 academic year and were subsequently employed in the healthcare industry in Iowa. An additional goal was to analyze and identify trends and themes surrounding the wages and income of these program completers. A third purpose was to determine what impact, if any, these program completers had on the shortage of skilled healthcare workers in Iowa, specifically what trends and themes could be identified in relation to employment in medically underserved areas of the state. A final purpose of this study was to determine if there were significant differences in earned wages between individuals who chose to work in MUAs, MUPs, and HPSAs and those who do not. All of these questions informed the larger theoretical framework of the study which looked at the nursing and Allied Health community college program graduates in within the context of human capital theory.

Research Question 1: Background Characteristics and Demographic Information of Iowa Community College Nursing and Allied Health Program Completers

The first research question used descriptive statistics to create a demographic portrait of the individuals who completed a nursing or Allied Health program at one of Iowa's 15 community colleges and subsequently were employed

in Iowa during all four quarters of one or more of the fiscal years from 2002 to 2007. The sample size was limited to individuals who completed community college education in academic year 2001-2002 and were not found in the National Student Clearinghouse in subsequent years- indicating they were not enrolled in another postsecondary institution.

Table 4.1 illustrates the total number of students in fiscal year 2002 who were identified as having listed a nursing or Allied Health program as their major or program of study. This is the only table in this study that includes individuals who did not complete a degree, diploma, or certificate program in 2002 since the emphasis of this study was on the post-college employment of these program completers. Students who elected to change their field of study, did not continue with their education, or were in the early to middle stages of programs were not included in the analysis of nursing and Allied Health program students since they were not eligible, in most cases, to work as credentialed healthcare providers until after they had completed their program of study.

As shown in Table 4.1, of the 4,636 students who had a nursing or Allied Health Classification of Instruction (CIP) number listed as their major or field of study, 1538 (33.2%) completed their community college education in the 2001-2002 academic year. The sample size used throughout the study was 1,538. It represents all 2002 program completers who obtained a credential in one of the 39 nursing and Allied Health programs offered at the community colleges, as identified by the Classification of Instruction program (CIP) number.

Table 4.1. Nursing and Allied Health program completers and non-completers, 2002 (*n*=4,636)

	Frequency	Percent
Completed a program	1,538	33.2
Did not complete program	3,098	66.8
Total	4,636	100

Table 4.2 illustrates the number of nursing and Allied Health program completers, as identified in the MIS database, who were subsequently employed for four consecutive quarters during each of the years studied in this project. Percentages of nursing and Allied Health program completers who were employed in all four quarters of each calendar year remained relatively consistent between 62.0 and 76.1% of the total 2002 program completers (*n*=1,538). While this number represents a large number of the 2002 program completers, the delimitation of "must having worked four successive quarters of a fiscal year" meant that those individuals employed part-time or on a seasonal basis were not included in the overall cohort of nursing and Allied Health workers.

It is also significant to note that, in 2002, there was a significantly lower number of completers who worked all four quarters of the fiscal year. This can be understood, in part, by the fact that, for many nursing and Allied Health graduates, completion of the program was not in and of itself the sole criteria for eligibility to work in the profession. Many program completers had to prepare for and take state and national certification and licensure exams before they were allowed to practice

Table 4.2. Percentage of all completers working, 2002-2007 (*n*=1538)

Year	Frequency	Percent
2002	953	62.0
2003	1,171	76.1
2005	1,132	73.6
2007	1,045	68.0

as healthcare providers. This, in part, explains the 22.8% increase for completers who worked all four quarters between 2002 and 2003.

Table 4.3 provides a breakdown of the specific community colleges from which the nursing and Allied Health program completers graduated in 2002 who went on to work all four quarters in the subsequent fiscal year (*n*=953). While it can be assumed that all colleges graduated more individuals than are represented in the table, these figures provide a snapshot of the location within the state where these program completers graduated.

These data show a consistent distribution of program completers from the 15 community colleges. Hawkeye Community College, North Iowa Area Community College, and Kirkwood Community College represent institutions with the greatest percentage of the program completers (13.6%, 13.5%, and 12.6%, respectively) while Iowa Lakes Community College had the smallest percentage of nursing and Allied Health program completers (2.0%). The data reveal that the community colleges located in the large urban areas are not necessarily the ones graduating the most nursing and Allied Health professionals. While Des Moines Area Community College in Des Moines and Kirkwood Community College in Cedar Rapids

Table 4.3. Nursing and Allied Health program completers and community college graduated from, in 2002 (*n*=953)

College Name	City	Frequency	Percent
Northeast Iowa Community College (10*)	Calmar	44	4.6
North Iowa Area Community College (12*)	Mason City	129	13.5
Iowa Lakes Community College (11*)	Estherville	19	2.0
Northwest Iowa Community College (4*)	Sheldon	6	0.6
Iowa Central Community College (10*)	Fort Dodge	57	6.0
Iowa Valley Community College (3*)	Marshalltown	40	4.2
Hawkeye Community College (8*)	Waterloo	130	13.6
Eastern Iowa Community College District (13*)	Davenport	66	6.9
Kirkwood Community College (19*)	Cedar Rapids	120	12.6
Des Moines Area Community College (10*)	Des Moines	68	6.9
Western Iowa Technical Community College (15*)	Sioux City	88	9.2
Iowa Western Community College (9*)	Council Bluffs	31	3.3
Southwestern Community College (3*)	Creston	37	3.9
Indian Hills Community College (11*)	Ottumwa	82	8.6
Southeastern Community College (8*)	West Burlington	36	3.8
Total		953	100

*Number of credit nursing and Allied Health programs offered.

historically have had the greatest number of credit students and are located in two of the more densely populated areas of the state, their completer rates are similar to smaller areas such as Ottumwa and Mason City.

Tables 4.4 through 4.6 use descriptive statistics to analyze demographic characteristics of the 2002 nursing and Allied Health program completers, and identify how these demographic traits compare to the entire population of community college credit students for each year analyzed. As shown in Table 4.4, the data reveal that female program completers significantly outnumber male completers,

Table 4.4. Nursing and Allied Health program completers and all credit enrollees by gender, 2002

	Nursing and Allied Health (*n*=1,538)		All Credit enrollees* (*n*=73,947)	
Gender	*f*	%	*f*	%
Male	118	7.6	32166	43.5
Female	1,420	92.4	41780	56.5
Total	1,538	100	73947	100

*Fewer than 10 individuals in the cell.
Source: Iowa Community Colleges, Credit Student Enrollment Report, Fall 2002.

with females 92.4% (*n*=1,420) of the program completers with males accounting for 7.6% of program completers that same year. Of the 1,538 individuals who completed one of the 39 nursing or Allied Health programs at a community college in 2002, only 118 were males. This compares with a more even distribution of 56.5% (*n*= 41,780) to 43.5% (32,166) for females and males, respectively, in the entire community college credit population (*n*=73,947).

As shown in Table 4.5, the age breakdown of nursing and Allied Health program completers reveals that the majority of completers were between the ages of 18 to 26 (*n*= 769, 50%), and a significant number of the remaining completers were distributed evenly among the 27-30, 31-19, and 40-55 age ranges (12.9%, 17.8%, and 15.5%, respectively). Among the 2002 community college credit student population as a whole, a larger percentage was revealed between the ages of 18 to 26 (*n*= 43,324, 58.6%), and the distribution in the 27-30, 31-39, and 40-55 age ranges was even, but smaller than the nursing and Allied Health program completers in 2002 (6.1%, 9.1%, and 7.8%, respectively). Among nursing and Allied Health program completers, there were significantly fewer students in the 18 to 22 year old

Table 4.5. Nursing and Allied Health program completers and all credit enrollees by age distribution, 2002

	Nursing and Allied Health (*n*=1,538)		All Credit enrollees* (*n*=73,947)	
Age	*f*	%	*f*	%
17 and under	37	2.4	11,927	16.1
18-22	441	28.7	35,631	48.2
23-26	328	21.3	7,693	10.4
27-30	199	12.9	4,524	6.1
31-39	274	17.8	6,719	9.1
40-55	238	15.5	5,748	7.8
Over 55	16	1.0	338	0.5
Unknown	*	*	1,317	1.8
Total	1,538	100	73,947	100

*Fewer than 10 individuals in the cell.
Source: Iowa Community Colleges, Credit Student Enrollment Report, Fall 2002.

age range (28.7% versus 48.2%) but, in all subsequent age ranges, the percentages of nursing and Allied Health program completers was almost twice that of the community college student population as a whole. This is probably due to the fact that many nursing and Allied Health programs require one or more semester of prerequisites before acceptance into the program. It also suggests that nursing and Allied Health programs attract a more diverse age population.

Table 4.6 compares the race and ethnicity of community college nursing and Allied Health program completers. In this and all subsequent tables cells that had fewer than ten individuals or responses, the data were suppressed and not included in the analysis. Not surprisingly, Table 4.6 reveals that Whites comprise a significant majority of the students completing a nursing or Allied Health degree, diploma, or certificate program in 2002 (*n*=1438, 93.5%). This is greater than the White

Table 4.6. Nursing and Allied Health program completers and all credit enrollees by race/ethnicity, 2002

	Nursing and Allied Health (*n*=1,538)		All Credit enrollees (*n*=73,947)	
Race	*f*	%	*f*	%
American Indian or Native Alaskan	10	0.7	530	0.7
Asian or Pacific Islander	*	*	1,272	1.7
Black	32	2.1	2,343	3.1
Hispanic	22	1.4	1,479	2.0
White	1,438	93.5	63,206	85.4
Chose not to answer	29	1.9	5,117	7.0
Total	1,538	100	73,947	100

*Fewer than 10 individuals in the cell.
Source: Iowa Community Colleges, Credit Student Enrollment Report, Fall 2002.

population of the total credit students enrolled in Iowa community colleges in 2002 (88.4%; *n*=63,206). The next highest represented race or ethnicity was Black, with 2.1% of nursing or Allied Health program completers (*n*=32) and 3.1% of all credit students in 2002 (n=2343). American Indian or Native Alaskans, Asian or Pacific Islanders, Blacks, and Hispanics were similarly represented in both the nursing and Allied Health group and the community college population as a whole.

Table 4.7 uses statistics from the MIS database to illustrate the distribution of the types of credential awarded to the 2002 nursing and Allied Health program completers. The Associate of Applied Science (A.A.S.) degree was the most frequently conferred credential (*n*=823, 53.3%), while the diploma and the certificate were also common (30.0% & 13.1%, respectively). A small percentage (*n*=46, 3%) of "other" credit credentials were awarded. "Other" represents a catch-all category of credentials and certifications that were identified by community colleges as

Table 4.7. Nursing and Allied Health program completers by credential awarded (*n*=1,538)

	Frequency	Percent
Associate of Arts degree	*	*
Associate of Science degree	*	*
Associate of Applied Science degree	823	53.5
Diploma	460	30.0
Certificate	202	13.1
Other	46	3.0
Total	1,538	100

*Fewer than 10 individuals in the cell

credentials awarded by one or more institution but not common enough to merit their own category or classification. The nature of healthcare-related training often makes such specialization and niche education a necessity.

Table 4.8 indicates that a significant majority of the degrees, diplomas and certificates awarded went to White individuals. This is consistent with the data in

Table 4.8. Nursing and Allied Health program completers: Race/ethnicity by credential awarded (*n*=1,520)

	American Indian or Native Alaskan	Asian or Pacific Islander	Black	Hispanic	White	Total
Associate of Arts degree	*	*	*	*	*	*
Associate of Science degree	*	*	*	*	*	*
Associate of Applied Science degree	*	*	15	*	778	
Diploma	*	*	*	*	427	
Certificate	*	*	10	*	180	
Other	*	*	*	*	46	
Total	10	*	32	22	1,438	1,520

*Fewer than 10 individuals in the cell.

Table 4.6 which reveal that 93.5% of all program completers were White. A comparison of types of degrees by race and ethnicity was not possible due to the small number on non-White completers represented in the sample.

Research Question 2: Types of Programs Completed

The second research question used descriptive statistics and crosstabs to analyze the credentials awarded and the types of programs that were completed. In this table many of the data were suppressed due to small numbers. However, a trend that was identified was the uniformity in which individual programs of study awarded the same credential among the 15 community colleges.

Of the 39 programs included in the analysis, nine (23%) had the same credential awarded among all colleges where the program was offered. In many other instances, typically one or two institutions varied from the common credential. The two most frequently offered programs, Nursing Associate Degree and Practical Nursing, included the greatest number of completers (*n*=904, 59.0%) and were each offered for only two types of credential (A.A.S. or diploma and diploma or certificate, respectively) among all 15 colleges. The most common areas of study for which degrees, diplomas and certificates were awarded included nursing (*n*= 1,024), Certified Nurse Aide (*n*=101), and Dental Assisting and Hygienist (*n*=91).

Table 4.10 uses the UI data to reveal the type of credentials awarded to 2002 nursing and Allied Health program completers in the 24 quarters included in this study. As shown in this table, the Associate of Applied Science (A.A.S.) degree was

Table 4.9. Nursing and Allied Health program completers by program completed and CIP (*n*= 1,538)

Program	AA	AS	AAS	Diploma	Certificate	Other	Total
Chiropractic Assistant	*	*	*	*	*	*	*
Dental Assisting	*	*	*	46	*	*	46
Pre-Dental Hygiene	*	*	*	*	*	*	*
Dental Hygiene	*	*	44	*	*	*	45
Dental Laboratory Technology	*	*	*	*	*	*	*
Health Care Administration	*	*	*	*	*	*	*
Medical Office Management, Advanced Standing	*	*	*	*	*	*	*
Health Information Technology	*	*	20	*	*	*	22
Health Information Transcription	*	*	*	12	*	*	12
Health & Medical Administrative Services	*	*	*	*	*	*	*
Medical Assisting	*	*	*	*	*	*	31
Associate Degree- Medical Assisting	*	*	*	*	*	*	*
Occupational Therapy Assisting	*	*	15	*	*	*	15
Pharmacy Assisting	*	*	*	*	*	*	*
Physical Therapy Assisting	*	*	33	*	*	*	33
Electroneuroencephagraph Technology	*	*	*	*	*	*	*
Emergency Medical Technology, Paramedic	*	*	*	*	*	*	*
Emergency Medical Technician, Basic I	*	*	*	*	*	*	*
Emergency Medical Technician, Intermediate	*	*	*	*	*	43	44
EMT- Iowa Paramedic Specialist	*	*	*	*	*	*	*
Radiologic Technology	*	*	28	*	*	*	28
Respiratory Therapy	*	*	24	*	*	*	24
Surgical Technology	*	*	*	23	*	*	24
Diagnostic Medical Sonography	*	*	*	*	*	*	*
Magnetic Resonance Imaging (MRS)	*	*	*	*	*	*	*
Medical Laboratory Technology	*	*	19	*	*	*	19
Phlebotomy	*	*	*	*	*	*	*
Alcohol/Drug Abuse Specialty	*	*	*	*	*	*	*
Mental Health/Human Svcs Technician	*	*	*	*	*	*	*
Nursing, Associate Degree	*	*	477	38	*	*	515
Nursing, Advanced Standing	*	*	120	*	*	*	120
Nursing, Surgical	*	*	*	*	*	*	*
Practical Nursing	*	*	*	291	98	*	389
Nursing Assistant	*	*	*	*	101	*	101
Optometric Assisting	*	*	*	*	*	*	*
Rehabilitation Services, Other	*	*	*	*	*	*	*
Medical Secretary Specialist*	*	*	*	*	*	*	*
Medical Administrative Secretary Management*	*	*	11	*	*	*	13
Medical Secretary, Transcription Management*	*	*	*	*	*	*	*
Total	*	*	823	460	202	46	1538

* Fewer than 10 individuals in the cell.

Table 4.10. Nursing and Allied Health program completers: Type of credential by year

	2002	2003	2005	2007
Associate of Arts degree	*	*	*	*
Associate of Science degree	*	*	*	*
Associate of Applied Science degree	535 (56.1%)	650 (55.5%)	623 (55.0%)	577 (55.2%)
Diploma	257 (27.0%)	340 (29.0%)	328 (29.0%)	306 (29.3%)
Certificate	118 (12.4%)	141 (12.0%)	139 (12.3%)	120 (14.5%)
Other	36 (0.4)	33 (2.8%)	37 (3.3%)	36 (3.4%)
Total	953	1,171	1,132	1,045

*Fewer than 10 individuals in the cell.

consistently the most common credential of those program completers working in Iowa following graduation from the community college. The percentage of program completers with an A.A.S. degree remained consistent between 55.0% and 56.1% from 2002 to 2007. The percentage of program completers between 2002 and 2007 who received diplomas were fewer, but equally consistent, ranging between 27% and 29.3%, whereas those who received certificates ranged from 12.0% to 14.5%.

Research Question 3: Distribution of Nursing and Allied Health Program Completers Employed in Medically Underserved Areas, Medically Underserved Populations, and Health Professional Shortage Areas

The third research question of this study looked at the distribution throughout Iowa of the 2002 community college nursing and Allied Health program completers, specifically whether or not they worked in Medically Underserved Areas (MUAs), for Medically Underserved Populations (MUPs) and/or within Health Professional

Shortage Areas (HPSAs), as designated by the United States Department of Health and Human Services.

Table 4.11 reveals that the distribution of these program completers among the identified areas as being medically underserved, and those not designated as such is consistent among the four years studied. From 2002 to 2007, the percentage of nursing an Allied Health program completers working within a Medically Underserved Area, Medically Underserved Population, or a Health Professional Shortage Area was between 40.6% and 42.3%. During the same years, the percentage of completers working outside the MUAs, MUPs, and HPSAs was between 57.7% and 60.4%.

Table 4.12 reveals that the completers who received certificates were the only group with a higher percentage to work within the Medically Underserved Areas. All other credentials have a higher percentage working outside these areas. What is revealing in this table is that all credentials awarded, with the exception of the certificate, had higher percentages of program completers working outside the MUAs, MUPs, and HPSAs than inside them. Program completers who received an

Table 4.11. Nursing and Allied Health program completers: Work in MUA/MUP, or HPSA

Area of work	2002	2003	2005	2007
In MUA, MUP, or HPSA	398 (41.7%)	476 (40.6%)	449 (39.6%)	443 (42.3%)
Outside MUA. MUP, or HPSA	555 (58.3%)	695 (59.4%)	683 (60.4%)	602 (57.7%)
Total	953	1,171	1,132	1,045

Table 4.12. Nursing and Allied Health program completers: MUA/MUP/HPSA by credential awarded

	-2002- work within MUA, MUP, HPSA	-2002- work outside MUA, MUP, HPSA	-2003- work within MUA, MUP, HPSA	-2003- work outside MUA, MUP, HPSA	-2005- work within MUA, MUP, HPSA	-2005- work outside MUA, MUP, HPSA	-2007- work within MUA, MUP, HPSA	-2007- work outside MUA, MUP, HPSA
Associate of Arts degree	*	*	*	*	*	*	*	*
Associate of Science degree	*	*	*	*	*	*	*	*
Associate of Applied Science degree	196 (20.6%)	339 (35.5%)	233 (19.8%)	417 (35.6%)	224 (19.7%)	399 (35.2%)	228 (21.8%)	349 (33.3%)
Diploma	109 (11.4)	148 (15.5%)	138 (11.7%)	202 (17.2%)	131 (11.5%)	197 (17.4%)	130 (12.4%)	176 (16.8%)
Certificate	77 (8.0%)	41 (4.3%)	90 (7.6%)	51 (4.3%)	74 (6.5%)	65 (5.7%)	68 (6.5%)	52 (4.9%)
Other	13 (1.3%)	23 (2.4%)	12 (1.05)	21 (1.7%)	17 (1.5%)	20 (1.7%)	14 (1.3%)	22 2.1%)
Total	398 (41.7%)	555 (58.2%)	476 (40.6%)	695 (59.3%)	449 (39.6%)	683 (60.3%)	443 (42.3%)	602 (57.6%)

*Fewer than 10 individuals in the cell.

Associate of Applied Science degree were much more likely to work outside an MUA, MUP, or HPSA, with 15.8% more working outside these areas in 2002–2007.

As shown in Table 4.13, when gender is considered, it appears that males are more likely to work outside Medically Underserved Areas, Medically Underserved Populations, and Health Population Shortage Areas. Between 2007 and 2007, the percentage of males working outside MUAs, MUPs, and HPSAs was consistently higher (63.0% – 68.6%) than the percentage of females working outside MUAs, MUPs, and HPSAs (56.6% – 59.8%).

Table 4.13. Nursing and Allied Health program completers: Work in MUA/MUP/HPSA by gender

	-2002- work within MUA, MUP, HPSA	-2002- work outside MUA, MUP, HPSA	-2003- work within MUA, MUP, HPSA	-2003- work outside MUA, MUP, HPSA	-2005- work within MUA, MUP, HPSA	-2005- work outside MUA, MUP, HPSA	-2007- work within MUA, MUP, HPSA	-2007- work outside MUA, MUP, HPSA
Male	30 (37.0%)	51 (63.0%)	32 (36.7%)	55 (63.2%)	29 (33.3%)	58 (66.6%)	27 (31.3%)	59 (68.6%)
Female	368 (42.2%)	504 (57.7%)	444 (40.9%)	640 (59.0%)	420 (40.1%)	625 (59.8%)	416 (43.3%)	543 (56.6%)
Total	398	555	476	695	449	683	443	602

Table 4.14 reveals that, with the exception of those 17 years old and under, more nursing and Allied Health program graduates work outside MUAs, MUPs, and HPSAs. The fact that the youngest completers are not legal adults and may still be living with their parents or guardians and, thus, are limited in their employment choices, may explain this anomaly in the data.

Research Question 4: Postcollege Annual Median Earnings of all Nursing and Allied Health Program Completers

The fourth research question in these analyses used descriptive statistics to study the annual median income of nursing and Allied Health program completers. Table 4.15 uses crosstabs to illustrate the median annual income by year and type of credential awarded. The data show that income rose consistently from 2002 to 2007 for all types of credentials. There was a significant increase from 2002 to 2003 for all credential types. Contributing to the low income levels in 2002 is the fact that the earnings in that year were based on the completer's last year in college. Since

Table 4.14. Nursing and Allied Health program completers: Crosstabs for work in MUA/MUP/HPSA by age

	-2002- work within MUA, MUP, HPSA	-2002- work outside MUA, MUP, HPSA	-2003- work within MUA, MUP, HPSA	-2003- work outside MUA, MUP, HPSA	-2005- work within MUA, MUP, HPSA	-2005- work outside MUA, MUP, HPSA	-2007- work within MUA, MUP, HPSA	-2007- work outside MUA, MUP, HPSA
17 and under	15 (78.9%)	4 (21.0)	14 (66.6%)	7 (33.3%)	16 (61.5%)	10 (38.4%)	16 (69.5%)	7 (30.4%)
18-22	133 (41.9%)	184 (58.0%)	135 (39.5%)	206 (60.4%)	127 (38.1%)	206 (61.8%)	126 (41.8%)	175 (58.1%)
23-26	77 (37.1%)	131 (62.9%)	86 (35.3%)	157 (64.6%)	88 (38.4%)	141 (61.5%)	87 (41.0%)	125 (58.9%)
27-30	62 (44.9%)	76 (55.0%)	60 (39.2%)	93 (60.7%)	58 (40.0%)	87 (60.0%)	60 (43.1%)	79 (56.8%)
31-39	59 (41.5%)	83 (58.4%)	92 (44.6%)	114 (55.3%)	81 (38.5%)	129 (61.4%)	78 (40.0%)	117 (60.0%)
40-55	57 (43.1%)	75 (56.8%)	80 (42.3%)	109 (57.6%)	70 (40.2%)	104 (59.7%)	69 (41.8%)	96 (58.1%)
Over 55	*	*	*	*	*	*	*	*
Total	397 (41.7%)	554 (58.2%)	475 (40.7%)	691 (59.2%)	447 (39.6%)	681 (60.3%)	441 (42.3%)	601 (57.6%)

*Fewer than 10 individuals in the cell.

most nursing and Allied Health professions require completion of an accredited program and/or subsequent licensure or certification, it is assumed that the income of this sub group as a reflection of the chosen health profession will not be truly represented until fiscal year 2003.

The data also show that the Associate of Applied Science degree yielded the highest median annual income, followed by diploma, and then certificate. This correlates with the length of time required to obtain the credential or certification, with an Associates degree requiring at least 60 credit hours; a diploma from 15 – 48

Table 4.15. Nursing and Allied Health program completers: Annual median income by type of credential awarded (in Iowa)

	2002	2003	2005	2007
Associate of Arts degree*	*	*	*	*
Associate of Science degree*	*	*	*	*
Associate of Applied Science degree	$16,509	$34,160	$40,269	$40,553
Diploma	$11,097	$21,595	$28,299	$30,070
Certificate	$11,967	$15,302	$16,344	$18,237
Other	$24,841	$24,485	$35,294	$26,346

*Fewer than 10 individuals in the cell.

credit hours along with general education requirements; and a certificate with less than 48 credit hours and no general education requirement.

As noted previously, the “Other” category is problematic in that it represents a small number of programs and credentials that exist with and are specific to certain professions or specializations. In Table 4.15, the “Other” category represents an outlier, with a very small percentage of specialized skill programs included in the category. With only 3% of all credentials awarded classified as “Other”, this group represents a small subset. Income in this category is unusually high, possibly due to the specialized nature and high demand for professionals in these areas.

Table 4.16 compares median annual income of all nursing and Allied Health program completers who work within a Medically Underserved Area, Medically Underserved Population, or Health Professional Shortage Area with those who work outside these areas. The data illustrate that in all fiscal years (2002, 2003, 2005, and

Table 4.16. Nursing and Allied Health program completers: Annual median income working in MUA, MUP and/or HPSA or working outside MUA, MUP, or HPSA

	2002	2003	2005	2007
Work in MUA, MUP, and/or HPSA	$14,339	$25,120	$31,651	$32,872
Work outside MUA, MUP, or HPSA	$14,486	$29,958	$36,262	$37,334
Difference	-148 (1.0%)	-4839 (16.2%)	-4612 (12.7%)	-4462 (12.0%)

2007) nursing and Allied health program completers who worked within a MUA, MUP or HPSA made less money than those who worked outside the areas.

Percentage differences ranged from 1.0% in 2002 to 16.2% in 2003. The small 2002 percentage can be explained, in part, by the fact that, for many nursing and Allied Health graduates, the completion of the program was not in and of itself the sole criteria for eligibility to work in the profession. Many program completers had to prepare for and take state certification and licensure exams before they were allowed to practice as healthcare providers. It was assumed that the 2002 income of program completers reflects earnings prior to work in the area of training or healthcare certification.

Research Question 5: Differences in Annual Median Postcollege Earnings Among Completers Who Work in MUAs/MUPs/HPSAs and Those Who Do Not

Tables 4.17 – 4.20 provide a descriptive analysis of the annual income of nursing and Allied Health program completers. These tables lay the foundation for the independent sample *t*-test that follows these tables. The data reveal that

Table 4.17. Descriptive statistics for income of completers who work within MUA/MUP/HPSA and outside MUA/MUP/HPSA, 2002

	Work within MUA/MUP/HPSA	Work outside MUA/MUP/HPSA
N	398	555
Mean	$14,804.91	$15,941.12
Median	$14,338.58	$14,486.42
Std. Deviation	8090.383	9050.769
Variance	65,454290	81,916421
Range	$51,410.53	$54,331.49
Minimum	$1,286.50	$473.05
Maximum	$52,697.03	$54,804.54

Table 4.18. Descriptive statistics for income of completers who work within MUA/MUP/HPSA and outside MUA/MUP/HPSA, 2003

	Work within MUA/MUP/HPSA	Work Outside MUA/MUP/HPSA
N	476	695
Mean	$25,642.26	$29,925.72
Median	$25,119.72	$29,958.31
Std. Deviation	11052.88	11893.5
Variance	1.2E+008	1.4E+008
Range	$63,349.01	$76,261.61
Minimum	-	$852.25
Maximum	-	$77,113.86

individual income ranged from a low of $473.05 in 2002 (Table 4.17) to a high of $119,821.88 in 2005 (Table 4.19). Median incomes increased each year, with the income of completers working outside MUAs, MUPs, and HPSAs always higher than those working within MUAs, MUPs, and HPSAs.

Table 4.19. Descriptive statistics for income of completers who work within MUA/MUP/HPSA and outside MUA/MUP/HPSA, 2005

	Work within MUA/MUP/HPSA	Work Outside MUA/MUP/HPSA
N	449	683
Mean	$32,232.87	$38,235.80
Median	$31,650.84	$36,262.38
Std. Deviation	15354.84	18982.52
Variance	2.4E+008	3.6E+008
Range	$94,946.65	$118,746.88
Minimum	$1,823.63	$1,075.00
Maximum	$96,770.28	$119,821.88

Table 4.20. Descriptive statistics for income of completers who work within MUA/MUP/HPSA and outside MUA/MUP/HPSA, 2007

	Work within MUA/MUP/HPSA	Work Outside MUA/MUP/HPSA
N	443	602
Mean	$32,034.27	$36,086.47
Median	$32,871.95	$37,334.14
Std. Deviation	13082.97	14646.64
Variance	1.7E+008	2.1E+008
Range	$74,479.75	$92,775.73
Minimum	$510.44	$2,382.91
Maximum	$74,990.19	$95,159.64

Table 4.21 reveals that a statistically significant difference exists in mean income between nursing and Allied Health program completers who work within a Medically Underserved Area, Medically Underserved Population, or Health Professional Shortage Area and those who do not. This one sample *t*-test for all variables yielded *p* values of less than .05 and, in most cases, much less than .001. The mean wage for program completers working within areas designated as

Table 4.21. Independent samples *t*-test for annual median post-college earnings and work in MUA, MUP, or HPSA or work outside MUA, MUP, or HPSA

Composite Variable	*t*	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Earnings in 2002	-2.034	906	.042	-1136.21	558.6190
Earnings in 2003	-6.314	1067	<.001	-4283.46	678.3690
Earnings in 2005	-5.851	1082	<.001	-6002.93	1026.0025
Earnings in 2007	-4.702	1004	<.001	-4052.20	861.8162

(*t*-test for equality of means)

medically underserved was smaller and statistically significant than for their counterparts outside these areas. During 2002, income differences were the smallest, although still statistically significant at the .05 level. As explained in previous chapters, 2002 reflected the pre-credential employment of nursing or Allied Health program completers during the last quarters of their time enrolled in the program. For the fiscal years of 2003, 2005, and 2007, the *t*-test revealed differences in mean annual income that were statistically significant at the .001 level.

CHAPTER 5. DISCUSSION AND CONCLUSIONS

This chapter provides a summary of the findings and implications for future study and policy decisions that arose from the conclusions. The audience for this research includes community college administrators, nursing and Allied Health faculty and other instructional personnel, community college students and potential students, legislators and policymakers, decision-makers within the healthcare industry in Iowa, and policy and decision-makers in local governments and agencies responsible for the healthcare policy decisions in their communities. It is hoped that by providing information on the demographics and decisions of Iowa community college nursing and Allied Health program completers insight will be gained that may help address the critical shortage of healthcare human capital- particularly in the state's medically underserved areas.

Summary and Discussion of Findings

The first section of this chapter summarizes and discusses the findings of the study. The discussion is organized into four sections that follow the structure and format of the research questions.

Student characteristics

The characteristic that is most striking when looking at the demographics and characteristics of Iowa community college nursing and Allied Health program completers is the fact that the overwhelming majority are female. In a state where 43.5% of those enrolled in credit community college programs are male (Iowa

Department of Education, 2002), the percentage of men in nursing and Allied Health programs is 7.6% (*n*=1538).

The paucity of men in the nursing and Allied Health professions is not new; nor is it an Iowa or a Midwest phenomenon. Nationally, the percentage of men working as nurses in 2002 was 5.7% (*n*=2,909,476) (HRSA, 2004). While this represented an increase over 20,000 since a previous study in 2000; nevertheless, it signifies a fraction of the overall nursing population.

There are several factors that contribute to the low number of men who choose to enter nursing and other Allied Health professions at a time when the demand is so great. Historically, nursing and Allied Health have been viewed as a female profession, in which there has been a great deal of social and societal resistance to the entry of men (Betz, 2006). A study conducted by the Breakthrough to Nursing collaborative in 2005 revealed that male nurses reported finding prejudice and stereotypes in the workplace, including the perception that men do not possess requisite compassion and that they are best used for “muscle” in certain limited situations. The study also revealed that 56% of respondents (*n*=498) had problems during their nursing education, most often related to communication difficulties with faculty and peers (NSNA, 2005).

The existing and future shortage of nurses and other Allied Health professionals and the under representation of men are also related to the increased opportunities for women in other professions (Robert Wood Johnson Foundation, 2009). Along with education and domestic professions, nursing and related Allied Health professions have historically been considered “women’s work”, with a related

corollary being that these areas are not suitable professions for men. As women have gained new freedoms, and struggled to gain entrance into professions and occupations from which they have historically been barred, there has occurred what Biene and Docquier (2001) referred to as a "beneficial brain drain" where skilled human capital has migrated to the healthcare field and other professions. This phenomenon has resulted in a vacuum that the male population has yet to fill.

When Becker et al. (1961) wrote the seminal ethnography, *Boys in White: Student Culture in Medical School,* the entire class of first-year medical students at the Kansas medical school was male. At the beginning of the book, the authors wrote, "For medicine is man's work" (p. 3). Today, while some specialties remain the exclusive purview of men, overall, the training of physicians has become more heterogeneous.

In 2007, the University of Iowa's Carver College of Medicine's class of 142 third-year medical students was comprised of 61 (43%) females. This was in contrast to the 1952 class that contained 9 women (11%) out of 85 students (University of Iowa. 2007). While females have been able to overcome the social and attitudinal barriers that prevented them from becoming physicians in the early 20th century, it would seem that males have not been successful in overcoming similar obstacles in order to practice as nurses or other Allied Health professionals.

The second characteristic that is striking about the demographic makeup of nursing and Allied Health program completers is the dominance of Whites in the gender and ethnicity category. While Iowa has traditionally been a heterogeneous state, with a White population of 94.4% (U.S. Census Bureau. 2007), 93.5% of

nursing and Allied Health program completers who were White was greater than the percentage of all credit students enrolled in the 2002-2003 school year (85.4%) (Iowa Department of Education, 2002). Generalizations are difficult when speculating as to the cause for this disparity. The mission of community colleges is to serve the communities in which they are located. This offers, perhaps, a partial explanation for the homogeneity among college students. A response to this finding is the belief that postsecondary education should embrace diversity in culture and population, and seek out minorities and the under-represented.

Clearly, the shortage of skilled healthcare workers described in Chapter 1 of this study creates a case for the need to expand nursing and Allied Health programs to include more diverse populations. The complicated prerequisites and difficulty many students have in navigating the application and acceptance process in these high-demand programs often does not bode well for the non-traditional or first time college student who may not be as skilled in navigating the system as his or her traditional peers. Many minority students are first generation college students and lack the requisite support systems and family background to navigate these complex programs.

The age of the nursing and Allied Health program completers is another way in which these students stand apart from the community college population as a whole. While 48% all credit enrollees were between the ages of 18 and 22 in 2002, and all other age groups were in the single digits (Iowa Department of Education, 2002), nursing and Allied Health program completers were evenly distributed across age groups, with almost as many students between the age of 23 and 26 as

between 18 and 22 (21.3% and 28.7%, respectively. The only exception was the small number of completers below 18 years of age (2.4%), which is easily explained by the nature of professional nursing and Allied Health programs, in which many have minimum age requirements.

One interpretation regarding the diversity in age ranges is that nursing and allied Health programs in Iowa are successful in reaching out to non-traditional students and recruiting older or returning students for healthcare professions. It is common for non-traditional students to return to school in order to gain more training in an existing career or education for a new career. With much discussion in the popular media of the need for nurses and other skilled health professionals, it is likely that older, non-traditional students are returning to school for training and re-training in high-demand professions.

Community colleges, by virtue of their mission, seek to be inclusive and provide training and re-training for returning students. Consistent with a key tenet of human capital theory, that more education equals a greater return on investment (Becker, 1962), the representative age demographics of nursing and Allied Health program completers suggest that community colleges are demonstrating success in this arena.

The even distribution of nursing and Allied Health program completers suggests that, in the future, Iowa may not face the significant drop-off in the number of healthcare providers that is predicted in the near future as indicated in Table 2.4. As retirements are distributed across age bands, the need to replace retiring workers in the future will tend to occur over several years.

One finding revealed in an analysis of the descriptive data is that the largest community colleges and the colleges located in heavily populated or urban areas are not necessarily the most successful in producing nursing and Allied Health program graduates. In addition, the offering of many different degree, diploma, or certificate programs does not necessarily equate to more graduates.

In Iowa, colleges in the large urban centers of Cedar Rapids and Des Moines accounted for only 19.5% of all program completers in 2002. At the same time, smaller communities, such as Mason City, Sioux City, and Ottumwa, had 13.5%, 9.2%, and 8.6% program completers, respectively. Similarly, while Iowa Lakes Community College offered 11 discreet nursing and Allied Health programs, only 19 students graduated from these programs in 2002. This can be contrasted with Iowa Valley Community College, where 40 students graduated from one of three credit degree, diploma, or certificate programs.

One component that this study did not account for was the length of time or curriculum of individual programs. While it is possible to measure success based on programs offered or number of graduates, generally these statistics do not paint a complete picture. A short certificate program that consists largely of didactic classroom instruction, such as Health Information Technology or Medical Administrative Secretary, may be able to accommodate four to five times as many students as a two-year nursing program that relies heavily on laboratory and clinical components, and requires much smaller instructor-to-student ratios. A closer analysis of specific programs was beyond the scope of this study but is an area of future research.

Finally, the descriptive statistics in this study clearly revealed that a significant majority of those individuals completing community college nursing and Allied Health programs obtained Associate degrees, primarily Associate of Applied Sciences. Although there were several cases of Associate of Science and Associate of Arts (AA) degrees, these data were suppressed in the analysis in Chapter 4, and grouped as A.A.S. degree for the purpose of discussion in this chapter.

The data revealed that 53.5% of program completers in 2002 obtained an Associate degree, followed by Diploma recipients (30.0%), and Certificate program completers (13.1%) (*n*=1,583). While it is discussed later in this chapter, it is worth noting that the demand for these degrees, diplomas, and certifications correlates with the amount of time required to obtain them as well as the amount of money that will be earned upon employment in the healthcare field, which confirms human capital theorists' beliefs that an increased investment in education (general knowledge) will lead to an increased realization in reward (typically financial) (Becker, 1993; Graf. 2001; Hlavna, 1993).

Post-college employment

The data in this study revealed that, as a whole, community colleges are doing a good job in supplying the healthcare industry in Iowa with much needed human assets. Of the 1,427 discreet in-state employers listed in the UI database in 2002, 1,328 (93.0%) are healthcare or healthcare related. This includes hospitals, doctors and dentists offices, long-term care centers, optometry shops, home health agencies, and prehospital healthcare agencies, to name just a few. This study did

not capture the effect volunteerism and part-time work might have on these numbers. The limitation of the UI dataset precludes a more detailed analysis of what constitutes “work” in the area of training and education, and did not allow for the reflection of those who volunteer for local ambulance and fire services or at local medical clinics—all the time while working a fulltime, non-healthcare job. This was a limitation and is discussed more in recommendations for future research.

An interesting statistic of the community college nursing and Allied Health program completers is that, for all credentials except the certificate, there are more completers working outside Medically Underserved Areas, Medically Underserved Populations, and Health Professional Shortage Areas than there are working within these areas. Completers who obtain certificates are consistently more likely to choose jobs within the areas of greatest medical need than all other completers. While it is impossible to determine why this occurs, one can speculate that these short-term, lower-paying jobs in healthcare are more prevalent and, thus, more easily obtained by those with less skill and training. It is also possible that the pay for these positions is a barrier to individuals who want to move to urban areas, and that the lower cost of living in the MUAs, MUPs, and HPSAs leads to a migration of diploma obtainers to these areas.

With the exception of certificate program completers, there is an overall preference on the part of all nursing and Allied Health program completers to work outside MUAs, MUPs, and HPSAs. Table 4.12 illustrates this trend, with 39.6–42.3% working within the medically underserved areas in the years studied and 57.7–60.4% electing to work outside of Iowa’s medically underserved regions. One

might assume that, given the high demand and low supply of skilled healthcare workers, if money were the only determining factor in the employment decision of these program completers, then the percentage of those working outside MUAs, MUPs, and HPSAs would be much higher. With only 30.0% of Iowa's counties identified as HPSAs, 10% labeled Medically Underserved Areas, and 6.0% identified as containing Medically Underserved Populations, it would not be unrealistic to expect that the number of program completers working in these areas would be much smaller. Discussion later in this chapter will cover the non-monetary drivers that may be leading program completers to choose employment in these medically underserved areas as well as the roles these factors play to inform human capital theory that is crucial to this study.

Another significant finding relating to post-college employment of program completers is that a greater percentage of males than females choose to work outside MUAs, MUPs, and HPSAs. The percentage of males who worked outside these areas in the years studied ranged from 63.0–68.6%, while their female counterparts ranged from 56.6–59.0%. It is possible to speculate that this is a result of males choosing to work in larger urban areas where preconceived beliefs and stereotypes regarding males and the nursing profession are not as pronounced. Another explanation points to the law of supply and demand, and the notion that employers desiring greater diversity in gender as well as race and ethnicity will seek and court male nursing and Allied Health program completers. Both monetary and non-monetary incentives could be used to persuade members of this minority

population to work in these areas, while employers in the MUAs, MUPs, and HPSAs cannot match such inducements.

Finally, it would appear that, when considering age, a majority of program completers in most age categories will elect to work outside MUAS, MUPs and HPSAs. The exception to this is in the 17 and under age range, where the percentage of completers who chose to work in MUAs, MUPs, and HPSAs ranged from 61.5%–78.9%. This can be explained by the fact that most of these program completers are probably not as mobile as their older counterparts and may still live with a parent or guardian, allowing them less freedom to move outside an MUA, MUP, or HPSA. Another explanation may be due to the age requirements for some licensing boards and professions.

Wages and income

One of the key findings of this study was “the greater the investment in time and education the greater the monetary return on that investment.” Education at the community college level is most often what economists classify as “general knowledge”, or knowledge that is obtained and may be used anywhere the particular skill set or training is needed (Hlavna, 1992). This is opposed to the notion of “firm-specific knowledge”, which is best described as on-the-job training, or training that is specific to a particular company or business. For example, general knowledge may include training in how to run a machine that bottles soda whereas firm-specific knowledge is the secret recipe for Coca Cola.

In this study it was clear that the length of the credentialing program was proportional to the annual income of the completer. This is consistent with findings revealed in previous studies of community college graduate earnings (Kerchoff & Bell, 1998; Laanan et al., 2006a), and conforms with Becker's (1962) assertion as one of the key underpinnings of human capital theory—that the incentive to expand or increase the individual's physical resources (in this case, education) depends on the increase in value or rate of return that is expected from that investment.

The independent sample *t*-test in Chapter 4 revealed that a statistically significant difference existed in mean income between nursing and Allied Health program completers who worked in a Medically Underserved Area, Medically Underserved Population, or Health Professional Shortage Area, and those who did not. This one-sample *t*-test for all variables yielded *p* values less than .05 and, in most cases, much less than .001. The mean wage for program completers working in areas designated as medically underserved was statistically significant and smaller than for their counterparts outside these areas.

From the data it can be concluded that working outside medically underserved areas will yield the healthcare providers greater annual wages. This fact, combined with the higher percentage of completers choosing to work outside MUAs, MUPs, and HPSAs is consistent with a basic tenet of human capital theory—that financial rewards influence the decisions that employees make when choosing where to allocate their own human capital.

It might be a mistake, however, to reduce the employment and migration patterns of the program completers to only the financial drivers. Jorgenson and

Fraumeni (1989, 1992) referred to “nonmarket compensation” when discussing human capital, and the decisions individuals make in their investment and realization of rewards. Nonmarket compensation includes factors such as leisure time, household production, investment in education, investment in child-rearing, and social-environmental quality of life issues, such as crime rates and air quality.

One may argue about meeting the healthcare needs in Iowa’s medically underserved regions community college graduates based on a focus on purely monetary factors rather than considering a more global or even an altruistic view of the world in which one makes decisions at the macro level as opposed to the individual or micro level. Becker (1962) demonstrated at the international level that businesses that employee workers in underdeveloped or economically depressed countries tend to be more “paternalistic” towards their employees. It is possible to extrapolate this paternalism and equate it with the benefits of working for a smaller healthcare entity—one wherein the CEO knows each employee’s name, and the advantages of small, non-urban lifestyle translate to benefits in the healthcare workplace.

Healthcare worker shortage

Finally, this study reaffirms that Iowa community colleges are adequately addressing the needs for more skilled nursing and Allied Health professionals. Previously in this chapter it was noted that the majority of nursing and Allied Health program completers who were working in Iowa were employed in the healthcare field (*n*= 1,427; 93%). This can be combined with the high percentages of program

completers (*n*=1,538) who were included in the UI database for all of the years reported who were working following program completion (Table 4.0). Of the 39 programs offered by one or more of the community colleges, all of the occupations listed as “much faster than average” and “faster than average” were offered, and 10 of the 13 fastest growing professions identified by the National Center for Health Workforce Studies (Bureau of Labor Statistics, 2004) were offered by community colleges.

Implications for Future Research

This quantitative analysis of the healthcare workforce in Iowa, and the influences on employment patterns, geographic location, and decisions on the educational investments (measured by credential) that community college program completers make has raised several questions. While the data provided valuable insight regarding the employment of these individuals, the limitations arising from use of secondary data suggest ample opportunities for future research in this area.

Several opportunities for future research and analysis center on the limitations of the UI and the MIS datasets. First and foremost is the valuable insight that can be gained from a quantitative analysis that identifies the completers, not only by where they work but also by their position and job description at a specific business. While the researcher perceived that the data remained robust throughout the process of research and extrapolation based on the nature and name of most employers included in the dataset, it would have been helpful to have the means ensure that a person who completed a nursing program at a community college and

worked at a hospital was actually employed as a nurse. To obtain the desired information, the data collected from the Unemployment Insurance (UI) database would need to capture job title as well as employer's name.

It would also be helpful if the dataset used in a future study includes non-credit Allied Health program completers. Currently, the 15 community colleges in Iowa do not offer non-credit nursing programs. This limitation also exists within the MIS data since it only captures completion information for credit programs. Future research in the employment patterns and decisions of students who complete programs in healthcare fields should include the individuals who complete short-term, non-credit programs such as Pharmacy Technician, Renal Dialysis Technician, Phlebotomist, and Certified Nurse Aide certification courses. While a few community colleges offer these programs for college credit, many do not. These short-term non-credit certification programs typically meet the prerequisites for positions in the healthcare world that do not require state or national licensure or certification (Margolis, 2009). While an employer may legally hire a person without this training, prospective employees benefit when they receive credentials. Credentials tend to render employees as inherently more valuable since the employer does not need to focus as much on the "general knowledge" of the profession and can, instead, focus on the "specific or firm-related knowledge", both of which are essential to raising the value in human capital of the employee (Hlavna, 1992).

A future study that includes non-credit healthcare programs, and the employment history as well as demographics of community college students would be able to provide information and insight into the value of a community college

education or training as opposed to the degree received upon completion. Previous research by Compton (2008) indicated that it is important to look at each program of study independently when researching how education benefits the individual. While credentials are important for some professions; for others, the skills one obtains have the greatest value. Comparing the wages and employment patterns of program completers who received a credit diploma for a Certified Nurse Aide course with those who received a non-credit certificate of completion may provide valuable insight regarding the value of a community college education.

Another area for future research that could be built upon the conclusions and findings of this study is a similar study that includes all completers, regardless of the number of quarters one works during each fiscal year. The limitations of the UI data precluded this researcher from studying program completers who had worked fewer than four quarters each fiscal year. While this had the advantage of standardizing the wage comparisons, it also led to a degree of variability in the sample size for each year studied. A more representative sample would include all individuals who were employed during a fiscal year, regardless of the number of quarters worked. This would enable future researchers to capture program completers who work multiple jobs that may include fulltime and one or more part-time positions.

Due to the need for 24-hour staffing at hospitals, EMS services and many other healthcare employers provide creative and flexible schedules for their employers. A paramedic who works for a fire service may work 24 hours straight and then be off for 48 or 72 hours. Nurses may work three 12-hour shifts a weekend, and a radiology technician may work 12 hours on site and then be at home while

remaining on call for another 12. These types of schedules lead many healthcare workers to take multiple jobs. A study that captures this information will not only provide a more robust sample, but it may also provide additional data related to the employment decisions regarding work within or outside Medically Underserved Areas, Medically Underserved Populations as well as Health Professional Shortage Areas. There are many healthcare workers who may work full time in a large urban area that is not medically underserved while also employed part time or on call for a smaller rural employer that is located in an underserved area (private conversation with Fiona Johnson, supervisor of Johnson County Ambulance Service).

A study such as this one can be used to make generalizations about the overall decision-making of individual healthcare workers regarding their employment choices. The theoretical framework of human capital theory is grounded in the belief that education is a commodity and that more education can be equated with an increase in value of the person obtaining that information (Becker, 1993). In this study, the decision-making process of the program completers was, at times, speculated or assumed from results based on median income or other factors. A future study based on a qualitative analysis of a representative sample of community college nursing and Allied Health program completers that poses questions specifically addressing their decision-making process and the factors that motivated them to make their employment choices would add value to the findings of the current study. While monetary incentives played a role and can be analyzed in the quantitative data, other non-monetary factors or “nonmarket compensation” (Jorgenson & Fraumeni, 1989, 1992) can be learned though qualitative interviews

that are recorded, transcribed, and then coded for interpretation. Bogdan and Biklen (2003) described the process of qualitative research as too complex to be distilled to a collection of facts; rather, the role of the quantitative researcher is to “grasp the basic interpretive nature of human behavior and the human experience” (p. 38). While quantitative analysis of human capital as pioneered by Gary S. Becker provides insight and predictability into the habits and behaviors of workers, research that emphasizes the individual and provides insight into the decision-making process of healthcare workers is essential to understanding the employment and migration patterns of these individuals.

While much research has been conducted on the shortage of males in the nursing profession, there has been a paucity of study regarding the shortage of males in the other Allied Health professions. This study revealed that males are represented across the healthcare education spectrum in addition to nursing education programs. Future research that seeks to replicate or refute these findings would be illuminating and provide direction for policy decision makers regarding Allied Health programs.

A study that examines involuntary attrition in nursing and Allied Health education programs might be an appropriate follow-up to this research. Future study that looks at those who do not complete programs as well as those who do might enable researchers to identify why some students do not complete programs. An analysis of success rates of first generation college students based on their demographic profile may provide insights into gaps and inequalities in the nursing

and Allied Health programs that, if addressed, could increase the number of minorities completing these programs.

Finally, future research in the area of the employment decisions of community college nursing and Allied Health program completers would benefit from an analysis of data that looks at correlations and relationships between specific factors and variables as possible predictors of behaviors and decisions. In this study, the researcher attempted to conduct a logistic regression analysis to determine the relationship between age, gender, and credential obtained, and the likelihood of whether or not a completer obtained work within a Medically Underserved Area, Medically Underserved Population, or a Health Professional Shortage Area. Unfortunately, the model did not fit and, consequently, a valid analysis was not possible.

Future study of this topic might also benefit from an analysis that aggregates the 39 programs studied into five or six “health career clusters” as subsets of the currently recognized Health Services career cluster (U.S. Department of Education, year). It was beyond the scope of this study to attempt such a clustering; however, the benefit of using clusters as a way of predicting the movements or migratory patterns of program completers might have significant implications on future research as well as future policy and practice.

Implications for Policy and Practice

The findings of this study offer several implications, and provide useful information for individuals in both education and healthcare. Information derived

from and decisions made as a result of these findings could potentially impact administrators, educators, health care providers, and students—both current and prospective.

The under-representation of males and minorities in healthcare and healthcare education should make administrators and decision-makers to pause to reflect on their roles in these areas. Beine et al. (2001) referred to the “ex ante brain effect”, wherein individuals see an investment in education as having a positive outcome based on the possibility for educational opportunities abroad or outside the state. This effect explains the tendency of individuals to migrate to areas where they see the greatest return on their investment in education. Reporting requirements associated with the Perkins Loan Program and other state and federally funded postsecondary programs offer opportunities for external benchmarking and data evaluation for community colleges nursing and Allied Health education programs.

With the looming crisis in healthcare resulting from a shortage of skilled workers, the untapped potential of males and minorities should be considered as a potential solution. While the racial and ethnic homogeneity of Iowa, combined with the community-based mission of community colleges, makes the challenge of increasing the diversity on college campuses a daunting challenge and one that is not exclusively one of the healthcare programs, the race/ethnicity gap in community college health programs is greater than that at community colleges as a whole. If enrollment officers and administrators in healthcare education programs are to increase their racial and ethnic diversity, they first need to recognize this gap and

address the issues that make entry into the healthcare professions difficult or undesirable for minority students.

In order to narrow the gender gap in healthcare education, leaders and administrators must seek to overcome generations of stereotypes and opinions that have alienated men and keep them out of the nursing and Allied Health professions. In this study, a 7.6% male representation in these programs reflects the need for serious consideration. If the impending shortage of nurses and other Allied Health professionals is to be addressed, then leaders in healthcare and healthcare education need to identify the barriers that keep men away and seek to overcome them.

At a time when the demand for entry into community college nursing and Allied Health education programs is growing (Iowa Department of Education, 2008b) the findings of this study should lead community college educators and administrators to consider the relative value of specific programs and credentials offered. A previous study of Iowa career clusters and community college program completers (Compton, 2008) has suggested that programs completers who receive some training or credentials do not realize a significant increase in income as a return on their education investment. In the current study individuals who completed certificate programs realized the smallest median annual income of all program completers. While it was beyond the scope of this study to make specific program recommendations or identify the career pathways that return the smallest amount in annual income, the findings suggest that college resources and program emphasis

could be shifted away from low-value programs to ones where students are able to maximize their education investment.

Another implication for future policy and practice based on this research is the finding that monetary factors are not the sole motivating factor influencing employment decisions made by community college nursing and Allied Health program completers. Variables that have an effect on the healthcare worker labor market and the decisions that healthcare workers make include population demographics, health care utilization patterns, education and training opportunities, work place environment, and the economy (Iowa Department of Public Health, 2003).

While the data in this study revealed that program completers outside medically underserved areas make significantly more money than those working within them, a large segment of the sample population still choose to work within these underserved areas. Community colleges and healthcare employers should consider this finding and seek thoughtful and creative ways to attract this in-demand segment of the employment population. Small rural hospitals, clinics, and other medical facilities are generally not able to lure these completers to their communities and businesses solely on the basis of financial incentives. Instead, they must provide “nonmarket compensation” (Jorgenson & Fraumeni, 1989) such as leisure time, household production, investment in education, and investment in childrearing. While some areas in Iowa that are not medically undeserved can offer completers a generous salary and many of them are located in large urban areas with a close proximity to the cultural, entertainment, and social service infrastructure, the smaller,

more rural medically underserved areas can appeal to many completers' desire for a slower, less complicated lifestyle, especially one wherein the disadvantages of the large urban centers (e.g., crime, cost of living, traffic, etc.) are not as pronounced.

A key finding in this study was that, while money was one variable motivating nursing and Allied Health program completers, it was not the sole variable. Historically, predicting and responding to the projected needs for a community's healthcare infrastructure has proven difficult:

> The size and characteristics of the future health workforce are determined by a complex integration of the health care operating environment, economic factors, technology, regulatory and legislative actions, epidemiological factors, the healthcare education system, and demographics. Efforts over the past several decades to model the supply of and the demand for healthcare workers show that there is a lack of consensus on the relationship between the health workforce and its determinants. (Health Resources and Services Administration, 2000)

With unemployment in the healthcare sector in Iowa at 0.4% (Bureau of Labor Statistics, 2004), the demand clearly is greater than the supply. Recognizing that nonmarket compensation plays a factor in employment decisions provides healthcare employers with a valuable array of additional incentives to recruit and retain employees.

Finally, the results of this study can benefit public officials, agencies, politicians and other policy makers in predicting the areas of greatest need for healthcare providers in the future and in seeking creative solutions to assist medically underserved regions in obtaining adequate healthcare personnel and infrastructure. Bhagwati and Hamada (1974) described the exodus of skilled workers from an economy as a "negative externality", and suggested that it often leads to

underdeveloped economies and inadequate growth potential at the national and international level.

This study looked at demographic information and wages of healthcare workers in Iowa to gain insight regarding the specific education and employment choices of these individuals. Human capital theory was used to understand migration and employment patterns of healthcare workers. Iowa, to some degree, reflects national and international patterns. Iowa might also be viewed as a microcosm of the globalization of healthcare, and the challenges states and nations face to ensure adequate healthcare for all citizens. Ultimately, the findings of this study may allow for better long-range planning and policy-making to provide a more even distribution of healthcare resources in the state.

Conclusions

Healthcare and healthcare education in Iowa face a future of uncertainty and change. With the impacts of globalization, economic volatility, and the changing demographics of both citizens and healthcare providers, the state is facing challenges that will require flexibility, agility, and a willingness to seek creative solutions to complex problems.

As a generation of healthcare workers retires, the population ages, and advances in science and technology call for highly specialized healthcare providers, community colleges in Iowa will be challenged to address the education, training, and re-education of the state's workforce. Historically, community colleges in Iowa have embraced this mandate and offered flexible, up-to-date training that meets the

general and firm-specific needs of employers and employees (both current and future).

The challenges facing Iowa in the 21st century revolve around how Iowa can best ensure that its citizens have access to the best possible healthcare and are able to receive care in their home community and/or region. Disparities exist in the quality and quantity of healthcare services nationally, as well as at the state, county, region, and township level (HRSA. 2007).

This study revealed there are economic incentives that lead employees to choose to work outside of medically underserved areas. The study also revealed that demographic themes and trends enable researchers and policy makers to understand and, in a sense, predict the migration and employment patterns of these healthcare workers. Human capital theory enables researchers to look at these patterns and trends within a quantitative framework. It is a gross oversimplification, however, to assume that salary and other economic incentives are the sole or primary drivers in the decisions of community college nursing and Allied Health program completers. In order to understand and react to the employment decisions of these individuals the nuances of human capital theory, one should also consider "nonmarket incentives" and inform policy decision-makers and planners of these multiple factors.

Becker (1993) stated that individuals maximize welfare "as they conceive it." This study attempted to reveal the interplay among individuals, community colleges, and healthcare employers in Iowa in a complex relationship, but one that can be understood. A greater understanding of these relationships can have a beneficial

impact on healthcare education, the healthcare economy, and, perhaps, most important, the healthcare and general physical well-being of all Iowans.

APPENDIX A. HUMAN SUBJECTS APPROVAL

IOWA STATE UNIVERSITY

Institutional Review Board
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Vice Provost for Research
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515 294-4566
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DATE: 15 August 2007

TO: Michael McLaughlin
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CC: Dr. Larry Ebbers
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FROM: Jan Canny, IRB Administrator
Office of Research Assurances

RE: **IRB ID** 07-374 **STUDY REVIEW DATE:** 13 August 2007

The Institutional Review Board has reviewed the project, "Community College allied health programs and Iowa's healthcare workforce" (IRB ID **07-374**) and has declared this study exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101 (b)(1). The applicable exemption category is provided below for your information. Please note that you must submit all research involving human participants for review by the IRB. Only the IRB may make the determination of exemption, even if you conduct a study in the future that is exactly like this study.

The IRB determination of exemption means that this project does not need to meet the requirements from the Department of Health and Human Service (DHHS) regulations for the protection of human subjects, unless required by the IRB. We do, however, urge you to protect the rights of your participants in the same ways that you would if your project was required to follow the regulations. This includes providing relevant information about the research to the participants.

Because your project is exempt, you do not need to submit an application for continuing review. However, you must carry out the research as proposed in the IRB application, including obtaining and documenting (signed) informed consent if you have stated in your application that you will do so or required by the IRB.

Any modification of this research must be submitted to the IRB on a Continuation and/or Modification form, prior to making any changes, to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

Exempt Category

(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.

APPENDIX B. AFFIDAVIT OF NONDISCLOSURE

AFFIDAVIT OF NONDISCLOSURE

Doctoral Student
(Job Title)

October 8, 2007
(Date of Assignment to Project)

Iowa State University
(Organization, State or Local Agency or Instrumentality)

N243 Lagomarcino Hall
Ames, IA 50011-3195
(Organization or Agency Address)

Iowa Department of Education and Iowa Workforce Development Matched Dataset
(Data Base or File Containing Individually Identifiable Information*)

I, Mike McLaughlin, do solemnly swear (or affirm) that when given access to the subject data base or file, I will not –

(i) use or reveal any individual identifiable information for any purpose other than statistical purposes specified in the survey, project, or contact;

(ii) make any disclosure or publication whereby a sample unit or survey respondent could be identified or the data furnished by or related to any particular person could be identified; or

(iii) permit anyone other than the authorized individuals to examine the individual reports.

(Signature)

* Request all subsequent follow-ups that may be needed. This form cannot be amended, so access to databases not listed will require submitting notarized Affidavits.

City/County of Linn Commonwealth/State of Iowa
Sworn to and subscribed before me this 10 day of Oct, 2007.
Witness my hand and official Seal.

NOTARIAL SEAL IOWA
GAYLE KENNEDY
COMMISSION NUMBER 164309
MY COMMISSION EXPIRES
MARCH 13, 2010

(Notary Public/Seal)

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