THE RELATIONSHIP BETWEEN SELECTED INSTITUTIONAL CHARACTERISTICS AND PROPORTION OF FEMALE DEGREE RECIPIENTS IN MEDICAL AND DENTAL DEGREE PROGRAMS

by

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ABSTRACT

Participation by women in undergraduate higher education in the U.S. has been steadily increasing over the last decade. These increases are now extending into graduate and professional education where more women than men now earn degrees at the doctoral level. While U.S. institutions overall are awarding degrees in the fields of medicine and dentistry to women in near equal proportion to that of men, it is still unclear if any genders differences in degree production in these fields exists between institutions based upon institutional characteristics.

This study used quantitative research methods to analyze data from the National Center for Education Statistics Integrated Postsecondary Data System (NCES IPEDS) Data Center on professional degree completions in medicine and dentistry at all U.S. institutions during the 2014-2015 academic year in order to determine the relationship between various institutional characteristics and degree production by women. The study found that institutional characteristics could be used to explain variations in medical degree production by gender, but not in dental degree production.

LIST OF ABBREVIATIONS AND SYMBOLS

[RU/VH]	Research Universities (very high research activity)
[RU/H]	Research Universities (high research activity)
AACOM	American Association of Colleges of Osteopathic Medicine
AACOMAS	American Association of Colleges of Osteopathic Medicine Application Service
AADSAS	Associated American Dental Schools Application Service
AAMC	Association of American Medical Colleges
ADA	American Dental Association
ADEA	American Dental Education Association
AMA	American Medical Association
AMCAS	American Medical College Admissions Test
ANOVA	Analysis of Variance
AOA	American Osteopathic Association
CIP	Classification of Instructional Program
COCA	Commission on Osteopathic College Accreditation
DAT	Dental Aptitude Test
DHHS	Department of Health and Human Services
DDS	Doctor of Dental Surgery
DMD	Doctor of Dental Medicine
DO	Doctor of Osteopathic Medicine

GPA	Grade Point Average
IC	Institutional Characteristics
IPC	Interprofessional Collaboration
IPE	Interprofessional Education
IPEDS	Integrated Postsecondary Education Data System
IRB	Institutional Review Board
LCME	Liaison Committee on Medical Education
MCAT	Medical College Admissions Test
MD	Doctor of Medicine
NCES	National Center for Education Statistics
NIH	National Institutes of Health
PBL	Problem-Based Learning
STEM	Science, Technology, Engineering and Math
UME	Undergraduate Medical Education
URM	Underrepresented Minority

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1:

INTRODUCTION

Introduction to the Study

The origin of women as degreed professionals in medicine and dentistry in the United States extends back to the nineteenth century. Elizabeth Blackwell was admitted to the Geneva Medical College in New York and became the first woman to earn a medical degree in the United States in January 1849 (Walsh, 1977). After earning her degree, she spent several years in Europe receiving additional training before returning to the United States in 1857 (Ludmerer, 1985). Lucy Hobbes Taylor studied dentistry at the Ohio College of Dental Surgery and earned her doctorate in 1866. Although these pioneering women broke through the gender barrier, more than a century would pass before significant numbers of women would begin entering these professions (Hyson, 2002). Linn (1971) examined the experiences of women entering the profession of dentistry at a time when the enrollment of women was just beginning to grow. The students he encountered found that they were being challenged both personally and professionally while pursuing a dental degree.

In order to address the importance of gender equity amongst healthcare providers and other medical professionals, gender equity must first be defined. Gender equity refers to equal access to goods, services, and employment, fairly to both men and women, without any discrimination on the basis of sex (Mencarini, 2014). Gender equity also requires addressing any imbalances, actual or perceived, in benefits that are available to men or women over the opposite

sex. In 2014, 54.1% of medical school applicants self-identified as men with 45.9% identifying as women. The same data showed that 52.2% of matriculants identified as men and 47.8% of matriculants identified as women. There were no alternative options for gender available, but it is pertinent to note that six applicants who declined to self-report their gender are not included in these statistics (American Association of Medical Colleges, 2016a). To examine the influence that these numbers have on access to health care, researchers need to examine overall population data. Based on the 2010 U.S. Census, the national population identified as 49.2% male and 50.8% female (U.S. Census Bureau, 2017). The census specifically asked for sex and there were, and currently are, no gender options available on the census form. This not only limits the ability to gather accurate data, but paints an incomplete picture of the population.

Many males or male identifying individuals feel more comfortable with male health care providers, while many female or female identifying individuals feel more comfortable with female health care providers. In a study of women seeking gynecological services, researchers found that of 500 patients surveyed they received an 87% response rate (435 patients). Of those 435 women, 225 (51.7%) had no preference, 194 patients preferred a female doctor (44.6%) and 16 patients preferred a male doctor (3.7%) (Makam, Mallappa Saroja & Edwards, 2010). There is less research on the percentages of men that prefer male physicians but, given the rates of employment by gender in specific specialties, inferences may be made. Men represent over 94% of urologic surgeons (Pruthi & Nielson, 2013). A 2013 study found that female residents were vastly underrepresented in the fields of neurosurgery, orthopedics, otolaryngology, general surgery, and radiology. The same study found that 74.9% of female residents specialized in pediatrics (Jagsi, Griffith, DeCastro & Ubel, 2014).

A 2015 AMA study found that women make up a larger percentage of residents in family medicine (approximately 58%), psychiatry (approximately 57%), pediatrics (approximately 75%), and obstetrics/gynecology (approximately 85%). The same study found that male residents preferred to specialize in surgery (approximately 59%), emergency medicine (approximately 62%), anesthesiology (approximately 63%), radiology (approximately 73%), and internal medicine (approximately 54%) (Vassar, 2015). Given the dramatically different rates at which men and women are entering specialties, one can make the inference that a lack of gender specific care in given fields can lead to people not seeking treatment as soon as they might otherwise should a doctor of the same gender be available. As the existing population of medical personnel ages, especially in professions like urology, the lack of quantity of providers will continue to have a significant influence on not only men's, but also women's, ability to gain access to trained and knowledgeable health care professionals (Pruthi & Nielson, 2013). Based on *The Physician Workforce: Projections and Research into Current Issues Affecting Supply and Demand*, a report published by the U.S. Department of Health and Human Services, by the year 2020, the U.S. is going to require a 30% increase in the number of urology specialists, a 25% increase in anesthesiologists, and a 25% increase in general internal medicine, all of which have been traditionally male dominated specialties, in order to keep up with the medical demands of the U.S. population (U.S. Department of Health and Human Services, 2013).

There are several options to help alleviate the stresses currently being placed on the system. Increasing recruitment efforts for women to study in fields where persons of their gender are lacking is one way to tackle the issue. The same DHHS study notes that while women who enter medical school are more likely than men to have a desire to practice in non-surgical specialties, they are also more likely than their male counterparts to be dissuaded from entering a

surgical specialty (U.S. Department of Health and Human Services, 2013). Working to not only actively recruit women into fields that have been traditionally male dominated, but also looking at the state of females in medical academia can lend itself to increasing the number of females that choose given specialties.

In academic medicine, not only does the 'glass ceiling' exist, but also what Tesch, Wood, Helwig and Nattinger (1995) proposed as the "sticky floor." In additional to finding that not only do fewer women get promoted in academic medicine, they also found that women were given fewer institutional resources at the beginning of their career, hence, the sticky floor. While women represent almost 50% of medical school students, women only represent 17% of tenured professors, 16% of full professors, 10% of department chairs, and 11% of medical school deans at academic medical centers in the U.S. (Jolliff, Leadley, Coakley & Sloane, 2012). The Association of American Medical Colleges is over 130 years old and has never had a female president.

Classic arguments for lack of female representation in medical academia include a lack of experience, that women do not compete for leadership positions for family reasons, and that women lack the necessary leadership skills. (Women Chairs of the Association of Medical School Pediatric Department Chairs, 2007). Such explanations are clearly inadequate, given the fact that while women make up the large majority of medical students and residents in pediatrics and psychiatry, they are still vastly underrepresented in leadership positions (Atre-Vaidya, 2006). There is a considerable amount of evidence that suggests that there has been a gross failure on the part of academic medical centers to advance women and that this is due in large part to the daily disadvantages that women deal with at each point of evaluation throughout their medical career (Valian, 2003). In a 2003 study, 40% of female respondents ranked gender discrimination

first out of 11 possible options for hindering their career advancement in academic medicine (Carr et al., 2003). Of these same respondents, 35% ranked it second only to a 'lack of mentoring' or 'limited time for professional work', both of which are barriers that disproportionately affect women in the workplace. In a 2007 study of 24 academic medical centers, all of which were top ranked in NIH funding and Carnegie classification, they found that if the institution used the word 'leader' in their criteria for reaching tenure, institutions were more likely to have fewer female tenured faculty than institutions that did not place the subjective word 'leader' in their position descriptions (Marchant, Bhattacharya & Carnes, 2007). Achieving tenure is key to career advancement and when masculine associated descriptors are used as a basis for assessment, women are promoted less often.

Gender diversity in the health professions is important to society as a whole. Voracek, Tran, Fisher-Kern, Formann, and Springer-Kremser (2009) focused their research on the interactions of students with their patients. They found that gender awareness contributes to equity and equality in health education and that patients and practitioners believe the practice of medicine should not be gender blind. They recommended support for successful implementation of enhanced integration. Fischbach and Hunt (1999) found that ethnic and gender diversity in the medical profession contributes to improved delivery of health care. Patients are more likely to seek care earlier from a provider of the same ethnicity and gender.

Although both the medical and dental literature frequently examine enrollment trends within their respective disciplines, relatively little research has been to compare differences between the professions. In particular, studies comparing the variations between these programs at institutions that offer both medical and dental degrees are scarce. This study investigated whether institutional characteristics such as control of institution, BEA regions, degree of

urbanization, basic Carnegie classification, institution has a hospital, institution size category, minority enrollment, and female enrollment contributed to differences in degree production by gender in these fields.

Historical Context

In the United States, there are currently two types of physician practices that are recognized by the American Medical Association (American Medical Association, 2017). Allopathic physicians (MDs) have been awarded a Doctor of Medicine degree and practice the classical form of medicine which is focused on the diagnosis and treatment of diseases. Osteopathic physicians (DOs) have been awarded a Doctor of Osteopathic Medicine degree and their practice is centered around a holistic view of treatment focused on treating the whole person. Both may be fully licensed physicians and are trained in diagnosing and treating illnesses and in providing preventive care (Bauer, 2017).

Doctor of Medicine Degree

American medical schools arose as a supplement to the apprenticeship system still widely practiced during the seventeenth and eighteenth centuries. Young aspiring physicians were indentured to a reputable practitioner wherein they began their careers by performing menial tasks with progressively increasing levels of responsibility. The quality of this type of training varied widely. In the early eighteenth century, practices from the Old World found their way to the United States leading to the founding of its first medical school in 1765. Students in the College of Philadelphia's New Medical School could work toward either a bachelor's degree (MB) or a doctor's degree (MD). The MB degree was the entry-level degree to the profession. An MD degree could subsequently be earned by a man at least 24 years of age, who had earned his MB degree at least three years previously, and had gone on to write and publicly defend a

thesis. In 1768, ten men received their MB degrees. Four of them then went on to earn MD degrees in 1771. This institution went on to become the University of Pennsylvania School of Medicine (Cassedy, 1991).

Doctor of Osteopathic Medicine Degree

Osteopathic medicine began in the nineteenth century as a health reform movement emphasizing preventive care that allowed the body to heal itself. It minimized the use of medications, many of which were becoming increasingly toxic in the unregulated era after the Civil War. Andrew Taylor Still was concerned about overuse of these medications and founded a new school of medicine that emphasized preventive care and the integration of the body's systems. He is considered the founder of osteopathic medicine (Orenstein, 2017).

Degrees in Dentistry

Schools of dentistry award the degrees of either Doctor of Dental Surgery (DDS) or Doctor of Medicine in Dentistry (DMD). When the Baltimore College of Dental Surgery, which subsequently merged with the University of Maryland School of Dentistry, was founded in 1840, it awarded the DDS degree to its graduates. The first dental school affiliated with a major university was founded at Harvard University in 1867. This institution traditionally only granted degrees in Latin and considered awarding the degree Chirurgae Dentium Doctoris (CDD) before settling on the Dentariae Medicinae Doctorae (DMD), for which the English translation is Doctor of Dental Medicine. By 2015, 24 of the U.S. dental schools award DMD degrees while the remaining 34 awarded DDS degrees (American Dental Association, 2017).

Dentists with either a DDS degree or the DMD degree are capable of and responsible for performing identical procedures. There is no special privilege afforded to holders of either degree and they both use the same curriculum requirements designated by the American Dental

Association and the American Dental Education Association. Public confusion occasionally occurs, as there are regional differences in the degrees held by active practitioners. Those who support the use of DDS base this upon the fact that dentists actually perform surgery by making incisions, removing structures from the body, extracting teeth, performing periodontal surgery, etc. Supporters of the DMD degree base their opinion that dentists are truly doctors of dental medicine and need to consider the patient as a whole when developing treatment plans. The Washington University School of Dental Medicine alternated between offering both DMD and DDS degrees at various points in its history from 1866-1991 (Lalumandier, Pyle & Sawyer, 1999).

Entry of Women into the Medical Profession

In the 18th and early 19th century, the majority of women's healthcare could be equated to the management of childbirth. Before male doctors overtook the field, this procedure was primarily performed by midwives and women without any classical medical training (Hoffman, Magrane, & Donoghue, 2000). Dr. William Shippen, of Philadelphia, was a vocal opponent to the capabilities of female midwives and their competency to perform this task and began to assist more affluent women with home-birthing, thus paving the way for men to enter what had traditionally been the feminine realm (Walsh, 1977). When more traditional methods of birthing were met with new, male-dominated medicine, treatments such as manual delivery with forceps and the use of ethyl ether as an anesthetic were often overused on patients (Leavitt, 1983).

J. Whitridge Williams, a professor of obstetrics at Johns Hopkins Medical School, surveyed obstetrics medical education in 1912 and found that, at most, students had only observed one delivery during their training, and more than 25% of medical schools admitted students not yet competent to practice this procedure (Leavitt, 1983). Still, medicine was a male-

dominated profession and by removing the well-practiced midwives from the equation in favor of what were considered modern instruments and drugs, maternal and fetal death rates continued to increase at an unnecessarily high rate. During this period, women‘s roles in society were that of inferior persons. By education, by law, by social status, and in political and property rights, there was no way in which a woman did not play a subordinate role to men (More, 1999).

The admission to, after having applied and having been rejected many times, and subsequent graduation from Geneva Medical College of Elizabeth Blackwell in 1849 became a turning point for educational access for women in the United States. Soon after her graduation, however, Geneva Medical College closed its doors to female applicants. Central Medical College of Syracuse opened soon after and became the first coeducation medical school, graduating three women in 1852. Shortly after this, Cleveland Medical College also began admitting women into their programs. Maria Zakrzewska was their first female graduate in 1856 (Loevy & Kowitz, 1999).

Harriot Hunt, in November 1847, just one month after Blackwell’s admittance to Geneva, submitted a request to be allowed to attend public medical lectures at Harvard University and was denied. Spurred on by this, she took on many feminist causes of the day, including abolitionism, and reapplied for permission to attend the public medical lectures in 1850, chastising Harvard officials that it was no longer a question of whether or not there would be female physicians, but whether or not female physicians would be adequately trained (Walsh, 1977). Harvard relented, but still stated she would never be allowed to take the examination for degree. After much backlash for the admittance of Hunt and three Black students, Harvard reversed their decision. Harriot Hunt spent over 25 years in active medical practice and sought to expand thinking and the realization of the necessity of women in the medical profession.

Entry of Women into the Dental Profession

Dentistry, much like medicine, began as a male-dominated profession. In 1859, Emeline Jones became the first woman to establish a dental practice in the United States. After practicing on patients without the knowledge of her dentist husband, Daniel Jones, he took her on as a full partner after she finally showed him her work, with which he was impressed. When Jones died in 1864, Emeline carried on the practice independently to support herself and her two children (Hyson, 2002). As a pioneer, not only in dentistry, but in business, Ms. Jones was highly and widely regarded in the community.

As the first woman to graduate from a recognized dental college, Lucy Hobbs was a pioneer in her own right (Hyson, 2002). A Cincinnati native, she applied to and was denied admittance into the Ohio College of Dental Surgery in 1859. After much hardship and perseverance, and an appeal from professional colleagues, Hobbs was admitted into the program in November 1865. After graduation, she, and her new husband, moved to Lawrence, Kansas, where she opened a successful practice and began training her husband in the study of dentistry.

As the United States progressed into the early 20th century, there begin to be slight but visible cracks in the seemingly miles-wide wall separating access to medical education for men and women in this country, although there were still some periodic set-backs. Standards for education in women's single gender colleges were higher than those in men's single gender colleges at the time, mainly due to the fact that not all single gender male colleges required a three-year course. Women attending early single gender or coeducation medical schools often faced problems in gaining access to clinical training due to the fact that hospitals would not accept them as interns or residents (Loevy & Kowitz, 1999). Given these circumstances, women were often left to rely on infirmaries and hospitals that offered a lesser student learning

experience. In 1892, with the opening of Johns Hopkins Medical School to women, the conditions of female students improved tremendously. The institution was required to accept women without discrimination based on gender. Johns Hopkins was also the first school to require students to have a bachelor's degree before beginning their medical studies (Loevy & Kowitz, 1999).

The Flexner Report

In 1910, Abraham Flexner, an educator who started his career at Louisville Male High School and went on to later open his own collegiate preparatory academy, published a comprehensive report, on behalf of the Carnegie Foundation, addressing the state of medical education in the United States and Canada. This was the result of a two-year study in which all 155 medical and osteopathic educational institutions operating in the United States and Canada, that granted MD or DO degrees at the time were analyzed. Flexner concluded that these institutions were too numerous, and that the educational offering at many of these institutions were substandard. He found that one of the primary limiting factors was inadequate funding for institutions not affiliated with a college or university. He recommended such concepts as minimum admission standard of a high school education followed by two years of study of science at a college or university, a medical school curriculum which consisted of two years of basic science education followed by two years of clinical training, and that free-standing or proprietary schools should be consolidated into a college or university (Flexner, 1910). As Flexner's recommendations were widely implemented, broad changes occurred throughout the medical education environment.

There is no doubt that the direction of modern medical education was shaped by Flexner. This influential publication was the culmination of a long crusade to both modernize and

standardize medical education. It brought public attention to the importance of societal support for high quality medical training. Flexner recognized that, even though the enrollment of women in medical schools was possible, even in 1910 not all medical schools were accessible to women. Still, he did note that while not every academic option was available to women, there were a wide variety of schools in which they could enroll. He noted in his report that many of the schools that he found to be unacceptable for reasons such as inadequate financial resources, lack of access to hospital beds, lack of laboratory facilities, and weak or ineffective management and governance were schools that admitted women (Halperin et al., 2010).

In addition, as access to education was made available to women, the number enrolled declined from 1,129 in 1904 to 921 in 1909 and 464 in 1916 (Chapman, 1974). Flexner suggested that the increased opportunities available to women in other professions may have negatively influenced the number of women entering medicine as a profession. In his opinion, the best choice for increasing the number of women entering the medical profession would not be accomplished by the creation of single gender, separate schools and hospitals for the training of women, but would be best accomplished by increasing support to develop high quality coeducational institutions. Although not a crusader for women's rights, Flexner recognized that it was neither necessary nor wise to separate men and women into separate institutions for their medical training.

The Gies Report

In 1926, Columbia University biochemistry professor William Gies published a report on behalf of The Carnegie Foundation that established the importance of dentistry as a learned profession, an essential component of health profession higher education, and as a healing science. This report was the result of a five-year study, during which Gies personally visited

every dental education institution in the U.S. in order to examine their teaching methods and the quality of dental graduates that they were producing. He concluded that the keys to progress in dentistry were a teacher who instructed and trained the practitioner, the researcher who shares knowledge with those teaching, and the practitioner who will service the patient directly (Gies, 1926). Gies believed that research should be funded for and conducted by training professionals and competent practitioners rather than corporate entities that have a self-serving interest in the outcome of the research.

Gies noted that while the dental profession was expanding rapidly, they were not adding practitioners in an evenly distributed way and that universities and dental schools were not doing enough to work to promote a uniform distribution of services. He was also concerned that while the elevations in educational requirements helped to produce more competent dental professionals and was of the utmost importance, it would have a negative impact on the number of providers completing training in the future. Gies concluded that the professional training that a dental professional received should give the person a true medical comprehension of their duties. He was a staunch advocate that dental schools should equal medical schools in their educational quality and influence, as their responsibilities and tasks are similar. He felt strongly that the dental graduate should be a peer of the medical graduate (Gies, 1926). There was a longstanding indifference to the development of the practice of dentistry and to the treatment of the abnormalities and diseases of the teeth and oral tissues. Many belittled the profession as “merely a mechanical art,” but through persistent work and determination, dental professionals were able to slowly change minds. He believed that making changes to the way that dental schools operated, and the way that they educated their students, would aid in the equalization of the professions. In order to overcome this perceived lesser status, Gies proposed strengthening dental

education to make it an equal counterpart to dental education. Sufficient funds would be needed to pay salaries to experienced and knowledgeable teaching professionals and there must be a plan set in place to choose the best and brightest teaching and training staff available. Standardizing education was key to raising the stature of the profession of dentistry. Requiring preparatory work at an academic college, dental specific curricula, and additional graduate curricula brought dental education to the same level of rigor their medical education counterparts.

Twentieth Century Trends

Over the quarter century following the release of Flexner's report, 89 medical institutions saw their doors permanently closed, primarily those of osteopathic medicine. The number of physicians in the United States fell from 173 per 100,000 in 1910 to 125 per 100,000 in 1935 and remained at that approximate level until 1960, when the physician population increased due to an expansion in the number of institutions and number of graduates per school in response to the Baby Boom. The guiding philosophy was to produce fewer but better doctors and that philosophy has endured to the present day.

Following World War I, medicine saw the rise of a new innovation in education; supervised patient care immediately following degree completion, or what is now referred to as internship. This gave new doctors the opportunity to hone their skills and patient management practices, while still under the supervision of a more tenured professional (Dezee, Artino, Elnicki, Hemmer & Durning, 2012). Subsequently, in the 1930s and 1940s, graduate medical education expanded yet again with further specialization in hospital-based residencies.

The Surgeon General Consultant Group on Medical Education produced a subsequent report in 1959 that concluded that there was an impending shortage of some 40,000 physicians in the US. As a result, efforts were made to further expand opportunities for physician training in

response to population increases during what is now referred to as the Baby Boom. Even with this expansion, Bayne-Jones and Bane (1959) felt that the quality of physicians being churned out at a rapid rate to compensate for the higher needs of a rapidly growing post-war population could lead to the profession being compromised. They argued that, just as those doctors that were trained hastily during wartimes had less than desirable outcomes, physicians trained in response to the ballooning society would meet the same fate. The supply of physicians continues to be very carefully regulated and has only been increased as a direct result of federal subsidies. This is primarily mediated through government funding of graduate medical education, or residency, programs in the hospital setting (Association of American Medical Colleges, 2016b).

Toward the latter part of the 21st century, there are radical advances in the progress women have made with access to medical education. Most notably, between 1970 and 2005, the percentage of female students to male students in medical schools increased from 11% to 48.9%. In that same timeframe, female representation amongst practicing physicians increased almost 900%; from 25,000 in 1970 to 225,000 in 2002 (Boulis & Jacobs, 2008).

Statement of the Problem

The problem is that, while U.S. institutions overall are awarding degrees in the fields of medicine and dentistry to women in near equal proportion to that of men, it is still unclear if any gender differences in degree production in these fields exists between institutions based upon institutional characteristics.

Female participation in undergraduate higher education in the United States has been steadily increasing over the last decade. These increases are now extending into graduate and professional education where, in 2009, more women than men earned degrees at the doctoral level (Bell, 2010). This increase does not extend across all disciplines, with engineering and

other sciences demonstrating the lowest enrollment of women and the humanities the highest. Near equal levels of enrollment have now been achieved in professional education in the health sciences, with women accounting for 48.5% of the matriculates into medical schools, and 44.2% of the matriculates into dental schools (Garrison, McAllister, Anderson & Valachovic, 2013).

In 2010, the U. S. Department of Education began using the classification of doctor's degree – professional practice for programs that were previously classified as first professional programs. These degrees are awarded in the fields of chiropractic medicine, pharmacy, dentistry, podiatry, medicine, veterinary medicine, optometry, law, osteopathic medicine, and theology. The programs in medicine and dentistry are generally taught at academic health science centers and use overlapping or complementary curricula in the basic sciences. The length of study for these programs is customarily four years following the completion of undergraduate training and the curriculum is extremely rigid and progresses in a lock step manner. These professional schools are accredited by either the Association for American Medical Colleges (AAMC), the Commission on Osteopathic College Accreditation (COCA), or the American Dental Association (ADA).

The advanced degree awarding programs in the following fields are currently classified as shown in Table 1 as doctor's degree – professional practice.

Table 1

Programs Classified as Doctor's Degree – Professional Practice

Chiropractic (D.C. or D.C.M.)
Dentistry (D.D.S. or D.M.D.)
Law (L.L.B., J.D.)
Medicine (M.D.)
Nursing Practice (D.N.P.)
Optometry (O.D.)
Osteopathic Medicine (D.O.)
Pharmacy (Pharm.D.)
Physical Therapy (D.P.T.)
Podiatry (Pod.D., D.P., or D.P.M.)
Veterinary Medicine (D.V.M)

Data Source: NCES, IPEDS, 2017

During the 2015-2016 academic year, 178 medical schools and 66 dental schools operated in the United States. Of the medicals schools, 145 offered allopathic medical training and conferred the degree Doctor of Medicine (MD); while 33 offered osteopathic medical training and conferred the degree Doctor of Osteopathic Medicine (DO). Of the 66 dental schools, 60 were operated by institutions that also operate allopathic medical schools, five were operated by schools that also operated osteopathic medical schools, and two were operated by institutions that do not also house a medical school (AAMC, 2016b).

Purpose of the Study

The purpose of this study was to use a standardized national data set to investigate institutional characteristics that may explain differences in degree production, by gender, at U.S.

institutions that award professional degrees in medicine and dentistry. Comparisons were made between the rates of degree production at each school and this was compared across institutions in an attempt to identify characteristics that contribute to these variations. Analysis was made based on control of institution, BEA regions, degree of urbanization, basic Carnegie classification, institution has a hospital, institution size category, minority enrollment, and female enrollment. By identifying characteristics that contribute to differences in degree production, the researcher provided information than can lead to further balancing of participation in medical and dental education across genders.

The research topic for this study focused on institutional characteristics and their relationship to gender differences in degree completion in professional programs in medicine and dentistry. This was investigated through quantitative analysis of existing data in medical and dental literature and published national data sets. This project focused on institutions awarding the degrees MD, DO, DMD, and DDS. These schools are accredited by the Association for American Medical Colleges (AAMC), American Osteopathic Association (AOA) or the American Dental Association (ADA).

Discrete enrollment and degree completion data are collected annually from all degree granting institutions in the United States through the Integrated Postsecondary Education Data System (IPEDS). Extensive literature describing overall enrollment characteristics in each of these programs at the institutional level exists. In addition, extensive analysis in the medical literature describes the characteristics of the applicants, enrollees, and graduates in each of these programs. This literature indicates that wide gender discrepancies still exist in participation, with enrollment by females ranging from 32% to 81% in dental programs (Garrison et al., 2013). The institutional characteristics which contribute to this difference are not clear.

Changes in enrollment by women in these programs affect the communities in which the programs operate (American Association of Medical Colleges, 2016b). Practitioners in the professions of medicine and dentistry comprise the governing boards, licensing agencies, and professional associations and must act cooperatively with one another to manage their influence and adequately respond to these needs and to protect the public. Policy makers must respond to the needs of their constituents and these needs may vary by region. Policy makers need to allocate the financial and educational resources that they control in order to meet the needs in their communities. Educational researchers use these changes as a tool to support the need for programs to address gender discrepancies throughout the enrollment pipeline; from recruitment, to application, to admission, to matriculation, and through completion.

Research Questions

This study addressed the following research questions. For these questions, the dependent variable is the percentage of all professional practice doctor's degrees conferred that are awarded to female students in the CIP codes of medicine (51.1201 medicine and 51.1901 osteopathic medicine) and dentistry (51.0401).

1. What is the percentage of medical degrees conferred by gender based upon these characteristics?
    - Control of institution
    - BEA regions
    - Degree of urbanization
    - basic Carnegie classification
    - Institution has a hospital
    - Institution size category

2. What is the percentage of dental degrees conferred by gender based upon these characteristics?

- Control of institution
- BEA regions
- Degree of urbanization
- basic Carnegie classification
- Institution has a hospital
- Institution size category

3. What combination of institutional characteristics best explains differences in the percentage of medical degrees conferred to females?
4. What combination of institutional characteristics best explains differences in the percentage of dental degrees conferred to females?
5. What differences, if any, exist between the characteristics affecting medical degree production and those affecting dental degree production?

Significance

The significance of this study lies in its ability to provide data that can be utilized by stakeholders to make informed decisions on future admission and enrollment practices. The stakeholders include students, faculty, institutions, and the community. Each of these stakeholder groups may contain several subsets.

The data in this study benefits students at multiple levels; potential, current, and graduating. Students currently enrolled in postsecondary education who are considering the pursuit of a professional degree, and are selecting institutions to which they will apply, can use this information to determine which institution will provide them with the level of gender equity

with which they seek to continue their studies. Current students can use this information as they choose institutions at which they will attend external clinical clerkships. Graduating students can use this information as they deliberate on their choice of locations to pursue postgraduate professional training and what possible specialties they would like to pursue.

New and experienced faculty alike can use the results of this study. Both can use these data to assess the environment, both within their own and across other institutions and new faculty members will be able to use the results of this to inform their decisions on their pursuit of a career in academic medicine.

At the institutional level, administrators can assess how their institution compares to their peers in terms of reaching gender equity. They also have the ability to use this information to guide them in the determination of a potential need for changes to their academic or administrative policies or procedures that may be needed to address their goals of gender equity.

Finally, the communities in which these institutions exist, and the nation as a whole, can use this information as they consider future funding to address any gaps that may still exist in medical and dental education.

Definitions

American Dental Association - A not-for-profit organization that is the nation's largest dental association and the leading source of oral health related information for dentists and their patients (American Dental Association, 2017).

American Dental Education Association - A not-for-profit organization representing academic dentistry whose membership includes all U.S. and Canadian dental schools (ADA, 2017)

American Medical Association – A U.S. association of physicians and medical students, both MD and DO, that promotes the art and science of medicine and the betterment of public health. (American Medical Association, 2017).

Association of American Medical Colleges – A not-for-profit organization comprised of U.S. and Canadian medical schools, teaching hospitals, and health systems. Their programs and services include the administration of medical school entrance examinations, and the accreditation of member institutions (Association of American Medical Colleges, 2017a).

Classification of Instructional Programs (CIP) - CIP codes are numerical identifiers that refer to specific fields of academic study. This code has a full range of identifying numeric data. There are numerous levels of CIP codes. For example, a two-digit CIP code refers to a general field (i.e. health professions and related programs) while a longer (6 digit) CIP code refers to a specific subfield (medicine). For purposes of this study, full CIP codes are used to identify degree programs (National Center for Education Statistics, 2017a).

Completer - A student who receives a degree, diploma, certificate, or other formal award. In order to be considered a completer, the degree/award must actually be conferred (National Center for Education Statistics, 2017b).

Dental School - A unit within a postsecondary institution, or a standalone institution, which awards with the degree DDS or DMD. This degree qualifies a graduate to become licensed as and practice as a dentist (ADA, 2017).

Gender - For purposes of this study, gender refers to the self-reported gender presentation of the individual submitting application or enrollment documentation. IPEDS database reporting currently offers only binary gender selection. (National Center for Education Statistics, 2017b).

Integrated Postsecondary Education Data System (IPEDS) - A collection of annual surveys in database format administered by the National Center for Education Statistics (NCES). Reporting institutional data to IPEDS is mandatory for all postsecondary institutions that participate in federal student aid programs. This includes a wide range of data, including enrollment, institution classifications, control or affiliation, and completions. (National Center for Education Statistics, 2017b).

Liaison Committee for Medical Education (LCME) – The LCME is the U.S. Department of Education recognized accrediting body for programs leading to the conferral of the Doctor of Medicine degree at institutions in the United States. The Association of American Medical Colleges (AAMC) and the American Medical Association (AMA) jointly sponsor the LCME (Association of American Medical Colleges, 2017b).

Medical School – A unit within a postsecondary institution, or a standalone institution, which awards with the degree MD or DO. This degree qualifies a graduate to become licensed as and practice as a physician (American Medical Association, 2017).

National Center for Education Statistics (NCES) - NCES is a federal office, in the United States Department of Education, that collects and stores a range of educational data (National Center for Education Statistics, 2017c).

Ultimate Graduation Rate – The rate at which students eventually complete a degree program, regardless of their length of study (Caulfield, Redden & Sondheimer, 2014).

Undergraduate Medical Education – Professional level training for physicians that is taught at the post baccalaureate level at institutions (AAMC, 2016a).

Assumptions

The current study was undertaken based upon the following a priori assumptions:

1. There is complete data in the IPEDS dataset.
2. There is accurate data in the IPEDS dataset.
3. There are differences, by gender, in the percentages of degrees conferred by institutions in their medical programs.
4. There are differences, by gender, in the percentages of degrees conferred by institutions in their dental programs.
5. Institutional characteristics explain differences in degree production by gender.

Delimitations

The current study was conducted with the acknowledgement of a priori delimitations:

1. The study involves only degrees which were reported in the CIP codes assigned to either medicine or dentistry (National Center for Education Statistics, 2017b).
2. Only IPEDS data for academic year 2014-2015 was analyzed.
3. Only data from the following surveys in IPEDS were used: Institutional Characteristics, Completions, and Finance and Human Resources.
4. Only institutions that are part of the 50 United States, District of Columbia, or U.S. territories and protectorates, and report data to IPEDS, are included for review.

Limitations

The current study was completed with the acknowledgement of a priori Limitations:

1. The quality and completeness of IPEDS data may lack consistency.
2. The focus of the study was on only degree production in specific fields; therefore, the results are not generalizable to other professional programs.

3. There are select factors outside of those studied which may affect the independent or dependent variables.

Organization of the Study

This study is organized into five chapters. They are: Chapter I: Introduction; Chapter II: Literature Review; Chapter III: Methodology; Chapter IV: Results; and Chapter V: Conclusions. An overview of each chapter follows.

Chapter I introduces the topic, and provides a rationale for conducting the study. A brief background and significance of the study provide support and context. The limitations, assumptions and delimitations of the study are also addressed.

Chapter II provides a relevant literature review. The sections include the current professional climate, trends in enrollment affected by this issue, and barriers to enrollment and the relevance of the issue in the larger society.

Chapter III of the study provides a methodological explanation for the review of the data along with the process and rationale for this approach. Research questions are presented, methods of analysis are explained, and the sources of data are presented.

Chapter IV provides results of the data analysis. Each research question is presented along with results which support the answer the question. Descriptive statistics are presented along with relevant data highlights within the text. Full data tables and data references are included in the body of the text, or in the Appendices.

Chapter V provides the conclusion to the study. Interpretation of results and implications for policy and practice are discussed. Recommendations for future research are also considered.

CHAPTER II:

LITERATURE REVIEW

The context of the research environment is of paramount importance throughout this dissertation. An overview of the pertinent literature is presented in three main themes; current professional climate and industry trends, enrollment perspectives, and barriers to access and societal implications. The climate of K-12 education and its influence on enrollment in higher education, along with challenges that women face as practicing physicians, dentists, and academic faculty is addressed in context of their current professional climate and industry trends. Current enrollment trends, followed by the barriers to enrollment and relevance that these outcomes have on society as a whole will close out Chapter II.

Current Professional Climate and Industry Trends

The pipeline for medical education begins when a child first sets foot into a classroom, therefore, it is appropriate to begin reviewing the professional climate with a look at the changing face of elementary (K-12) education. In recent years, a large focus has been placed on the nature and significance of gender differences in students and whether to teach to those gender differences that some see as inherent between boys and girls, or streamline an educational program designed for a gender-neutral classroom (Williams, 2013).

Climate in K-12 Institutions

In a study by the Office of Civil Rights (2012), girls represented 46% of the 1.1 million students enrolled in prekindergarten in the U.S. and 49% of elementary and secondary education

students. Since 1976, girls have outnumbered boys in enrollment in gifted and talented programs, with 8.1% of girls being enrolled in 2009 compared to 7.4% of boys. The data also showed that at all grade levels, boys are more likely than girls to be held back one year. When it comes to representation in high school sciences, boys and girls are enrolled in relatively equal numbers in biology and chemistry, but boys outnumber girls in the study of physics. Enrollment in mathematics courses is also relatively equal, regardless of gender or subject matter.

On the behavioral spectrum, girls of all races are less likely to be suspended out-of-school than boys in their same race category, although African-American girls are suspended out-of-school at higher rates than Latino, Asian/Pacific Islander and White boys (Office of Civil Rights, 2012). Nearly 55% of girls studied reported being bullied or harassed on the basis of sex, while 79.6% of boys were disciplined for bullying or harassing on the basis of sex. Of the 10,000 schools studied, 57% offered fewer athletic options for girls.

Education advocates seeking to level the educational playing field for girls have often been vocal proponents of single-gender education. Research has shown that girls perform better in science and math when learning in single gender settings. They are also more likely to volunteer for peer leadership positions and advocates postulate that removing the males gives females an environment free of male distraction, allowing them to focus on their education, without undue harassment (Sharpe, 2017). This does not mean, however, that all education advocates believe that single-gender education should be the preferred method of teaching. In fact, some argue that while extensive efforts have been made over the past decades at removing educational barriers for girls, boys are now being shortchanged by the system and are falling behind (Williams, 2013).

During school year 2010-2011, the national estimated 4-year adjusted cohort graduation rate for public high school students was 79%, and was 80% during the 2011-2012 school year. During this time, the adjusted cohort graduation rate for males was 77% versus 84% for females. The 2011-2012 data showed the rates to be 78% for males and 85% for females (Stetser & Stillwell, 2014). The public high school dropout rate remained constant at 3.3% during both terms. When the data was examined by race, African-American and Hispanic students matriculate at a rate below the national average at 69% and 73%, respectively. Students from economically disadvantaged backgrounds also graduate at rates well below the national average at 72%. Students with limited English proficiency rank lowest of all at 59%. Williams (2013) argues that the success rates of boys in K-12 education, which is most notable in 4-year completion statistics, is due to the heavy focus on increasing opportunities in the classroom for girls. She asserts that decades of efforts to overturn gender stereotypes regarding women and girls in the classroom, and to help them advance in education, have had the inverse effect on boys, their treatment in schools, and their ability to learn.

Kleinfeld (2009a) studied the gender gap in high-school seniors making post-secondary education enrollment decisions. While there were outliers, the survey found that most females were more likely to have more well-developed plans to attend college versus their male counterparts. Females saw furthering their education as vital, they wanted to make an impact in society, and the occupations they were seeking required furthering their education. The male students from college-educated families reported that it was an expected path for them to take, while those from working class backgrounds had less knowledge of the labor market and the amount of income needed to support the lifestyle they desired.

Climate in Postsecondary Institutions

The pursuit of higher education is key, not only to the individual, but to society as a whole. College educated men are less likely to lose their job during a recession and are less likely to be incarcerated. Not only has the gender gap in postsecondary degree attainment increased, but it increases substantially when race is considered. In 2006, among African-Americans, women obtained 69% of associate degrees, 66% of bachelor's degrees, and 72% of master's degrees. Among Hispanics during the same time, women obtained 62% of associate degrees, 61% of bachelor's degrees, and 65% of master's degrees (Kleinfeld, 2009b).

When looking for reasons for the gender gap in degree attainment, especially in minority groups, reference to high school matriculation rates is of the utmost importance. When fewer boys are graduating from high school, fewer men are entering into institutions of higher learning. Williams (2013) argues that, in the current educational environment, girls are told repeatedly that they have the ability to do and be anything, but that boys are stifled by a 'boys will be boys' mentality. She goes on to say that by teaching in a way that reinforces the gendered stereotypes of inherent masculinity, aggressiveness and unavoidable behavior from boys, that the boys themselves are truly being done a disservice. Furthermore, through more focus on the education of boys in a manner which makes them a priority, but at the same time does not make essential their masculinity, education reform can work to help these boys achieve their full and true potential, giving them the capability to seek higher learning later in life.

When it comes to pursing a post-secondary degree, encouraging women to pursue a career in medicine is no longer a far-fetched idea. In fact, attitudes on women's entrance into the medical professional shift dramatically, especially since the mid-1940s. The Gallup Organization has periodically polled Americans on this subject since World War II. In 1950, while more than

25% of people would recommend a career in medicine to a young man, only 2% would recommend such a career to a young woman. Moving forward 1998, the numbers had reversed. Only about 7% of people would recommend a career in medicine to young men, while recommendations to women jump to 11% (Boulis & Jacobs, 2008).

Climate in Professional Schools

Women have been able to enter medicine, not because men have fled the field in mass numbers, but because some of the overwhelming barriers that women faced for decades have been eroded. With the removal of those previous barriers, the increase in capacity for medical students at academic medical institutions, and the end of the mandatory military draft, women were given the ability to pursue an education once out of reach for them. Relative to other occupational choices, medicine offers great rewards for women who choose to pursue it. These rewards come not only in terms of financial gain, but also with the personal satisfaction of helping someone in their greatest time of need (Sanfey, Saalwachter-Schulman, Nyhof-Young, Eidelson, & Mann 2006).

Scarbecz and Ross (2002) describe the gender differences which exist in the motivation to pursue a degree in dentistry with men focused on financial issues and women focused on patient issues. In their study, they found that of 430 first-year dental students, 40.5% of whom were female, the reasons why the students chose to study dentistry were different. Males ranked their top three motivators as having a career that will give them adequate family time, being self-employed, and helping people improve their appearance. Females ranked wanting to help people, having a career that will give them adequate family time, and helping people improve their appearance as their top three motivators. There was a large statistical divide where men scored much higher than women in wanting to be self-employed and women scored much higher than

men in wanting to help people. The data also indicated that there are people-driven motives and financial motives, and the gender lines are clearly drawn.

Reichenbach and Brown (2004) propose that, if there is going to be a revitalization of academic medicine, institutions have to address the gender dimensions of how medical professionals are chosen, educated and promoted. The goal cannot just be to have equal numbers of male and female doctors, or gender equality, but rather focusing on the much larger necessity of guaranteeing fairness and justice in the academic and professional realms; in other words, gender equity. Reichenbach and Brown believe that focusing on enrollment, curriculum, and promotion can help lead us to gender equity. Women advance slower than men in academic medicine and there are far fewer women in leadership positions. This leads to an imbalance of power that is difficult to overcome.

In a 2013-2014 study by the Association of American Medical Colleges (2015), researchers found that, of full-time faculty, males made up 62%, while females accounted for only 38%. It is important to note, however, that this is an 8% increase for full-time female faculty over their 2003-2004 survey. When examining part-time medical school faculty, they found that males accounted for 55% and females only 45%. When looking at faculty rank in medical schools, men also lead in the titles of full professor, 79%, associate professor, 66%, and assistant professor, 56%. The only rank in which there are more females currently than males is instructor at 56%. It is worth noting that between the 2003-2004 study and the 2013-2014 study women gained ground in the title of full professor a full 7% (Association of American Medical Colleges, 2015). An even larger disparity can be seen when examining which departments have the lowest number of female faculty. In the basic sciences, physiology, biochemistry, and

pharmacology rank the lowest and, in clinical departments, orthopedic surgery, surgery, and radiology all have markedly lower than average numbers of female faculty (AAMC, 2015).

Gender disparities in medicine still remain when examining specialty areas, practice ownership, faculty representation, and leadership positions; all of which can have a large influence on a physician's salary. The disparities are even more apparent when factors like workplace discrimination, lack of organizational flexibility, and leadership opportunities are taken into account. When looking at leadership roles of current medical students, it is important to examine the roles that women play in their peer groups. In Wayne, Vermillion, and Uijdehaage's (2010) multiyear examination of 2008 and 2009 small group studies at University of California, Los Angeles, they found that a disproportionately small number of women volunteered to be small-group leaders when there were specific conditions for their leadership. In the 2008 study, 144 students attended small group sessions on reproductive physiology. There were 75 women and 69 men. During the 2009 study, 158 students, 81 women and 77 men, attended on the same topic. During the 2008 study, the instructions for the group leader were very direct. They were given more responsibility and put in the spotlight. The leader was to guide the small group discussion and, at the end, would have to come to the front of the room and lead the larger, class discussion. For the 2009 study, there were two different versions of the instruction sheet; the standard set used in 2008 and a second set, the intervention instructions, which were aimed at eliminating gender bias. It specifically mentioned that if an individual has never been a group leader before that this would be a safe space to do so, used the words 'whether male or female', and emphasized the importance of the experience. In the 2008 study, 52% of the session participants were female, while only 33% of group leaders were female. In the 2009 study, half of the participants received the control instruction and half received the

instructions aimed at eliminating gender bias. Fifty-one percent of the participants were female and 49% male. In the group that received the control instructions, there were 43 females and 34 males, which the intervention group had 38 females and 43 males. The control group again had significantly fewer female leaders than male leaders at only 27%. The intervention group, with the instructions aimed at removing gender bias, showed no significant difference between male and female leaders; 47% were female and 53% were male (Wayne et al., 2010). This study is of important note, as it is one of the first to discuss gender bias in student leadership in medical education.

The influence of gender bias can be seen in permanent leadership positions at academic medical institutions as well. Of Department Chairs, only 15% are female. Of Assistant Deans, only 46% are female. Of Associate Deans, only 39% are female, and of Senior Associate Deans/Vice Deans and Deans, only 33% and 16% are female (AAMC, 2015).

Trends in Medicine

In 2014, there were approximately 782,210 actively practicing medical physicians under the age of 75 who had completed their graduate medical education in the United States, up from 767,100 in 2013. Women accounted for 33% of those physicians. Until age 34, there are roughly the same number of male and female physicians actively working. Women also work approximately five fewer hours per week than their male counterparts through age 54, but among age 55 and older, they average only one to two hours fewer per week (AAMC, 2016a).

The gender composition of medical and dental schools continues to become more representative of the population, but physician demand continues to grow faster than supply. This will lead to a projected shortfall of between 61,000 and 95,000 physicians by 2025 (AAMC, 2016b). Projected shortfalls in primary care range from 14,000 to 35,000 physicians. For

specialties, physician retirement decisions are projected to have the greatest influence on shortfalls and nearly 33% of physicians will be over the age of 65 by 2025. Physicians between the ages of 55 and 75 currently account for 37% of active, working physicians. In the same 2015 study, the American Association of Medical Colleges found that while demand for physicians was projected to increase 11% to 17% between 2013 and 2025, the physician supply was only projected to increase 4% to 12% in that same time frame.

When examining why female physicians are more likely to leave academic medicine early in their career, Levine, Lin, Kern, Wright, and Carrese (2011) found that factors included frustrations with research including but not limited to funding difficulties, poor mentorship, work-life balance and the institutional environment as key reasons for their early exits. Physicians reported a disconnect between the culture of academic medicine and their own priorities, namely on how to define success, leading to feeling undervalued at work. Borges, Manuel, Elam, and Jones (2010) found, in a study of Generation X, who graduated in 1995 and 1996, and Millennial medical students, who graduated in 2003 and 2004, that there were significant differences between their needs for power and their needs for achievement and affiliation. Generation X students scored higher on the motive for power, while Millennial students scored higher on the motives for achievement and affiliation. Also, younger physicians tend to work 13% fewer hours than their earlier cohorts (AAMC, 2016a). From these data, it can be extrapolated that not only will there be fewer physicians, but that newer physicians are putting a greater emphasis on the work/life balance and will be available to see fewer patients than their predecessors who worked longer hours.

Trends in Dentistry

The same respective trends can be observed in dental leadership as well. While women are more likely to remain in dental education long term and chose an academic career path, women do not progress in status as fast as their male counterparts and still remain underrepresented in dental academics (Yuan et al., 2010). Scholarly production is a main component of advancement in academic medicine and dentistry. This 22 year observational study found that overall 13% of first authors and 9% of last authors were female, with 2% unidentified. The percentage of first female authorship ranged from 6% in 1986 to 21% in 2008. These findings are comparable with research done on authorship of scholarly publication in medical fields (Filardo et al., 2016). Despite a growing foothold, women are still underrepresented in academic dentistry as a whole.

When it comes to where to establish a practice once their training is complete, there are challenges that a new physician or dentist must overcome and important decisions that will have a lasting influence on the rest of their career. The choice of practice location by dentists subsequent to graduation can be important, particularly to rural communities, as demonstrated by McFarland, Reinhardt, and Yaseen (2010). Their research found that the presence of a dental school within a state, as well as the number of in-state students that enrolled, was directly correlated to the number of dentists that took up practice in said state. They also found that individuals who were raised in rural counties were more likely to establish their practice in a rural environment. In the coming years, workforce trends are indicating that, for every one dentist that opens practice, two will retire. (McKinnon, Luke, Bresch, Moss, & Valachovic, 2007). The consequences of these retirements could be catastrophic to rural communities and could severely limit their access to dental care. With this in mind, many schools in more rural

areas have made a concerted effort to recruit in-state students in hopes of training future dentists that are more likely to stay and practice in the region than their out-of-state counterparts (McFarland et al., 2010).

Enrollment Perspectives

The prerequisite requirements and the admission processes required to gain admission to medical and dental schools exhibit many similarities. This includes the pre-professional program of study pursued by students, required standardized testing, centralized application systems, personal statements, and in-person interviews. Even though the application process is centralized, individual medical schools and dental schools differ in admissions committee composition and specific admission criteria (Anderson & Kanter, 2010). This is not unique to the United States, in that similar application and screening processes are used in the admissions pipelines in Germany (Chenot, 2009) and Japan (Kozu, 2006).

Graduate Education

In a 2015 report on educational attainment in the U.S., compiled from data gathered from the 2015 Current Population Survey Annual Social and Economic Supplement, the U.S. Census Bureau (2017) noted that 88% of adults in the U.S. were at least high school graduates and more than 59% had completed some college or more. They also reported a negligible statistical difference in the percentage of males who held a bachelor's degree or higher, 32%, compared to females, 33%. As of that time, 12% of U.S. adults held an advanced degree such as a master's, professional or doctorate. The differences between males and females in completion of advanced degrees were also statistically negligible. When compared to historical data, this shift is dramatic. In 1967, 13% of men held bachelor's degrees compared to 8% of females. In 1990, Asian women, non-Hispanic White women, and Black women were all less likely than their male

counterparts to have earned a college degree. Since 2000, the trends have shifted dramatically (U.S. Census Bureau, 2017). It should be noted that data in this study did not include a study of the residents of Puerto Rico or U.S. Island Areas.

Okahana, Feaster, and Allum (2016) describe the biographic, demographic, and academic characteristics of general graduate education. In the fall of 2015, more than 1.78 million graduate students enrolled in graduate certificate, education specialist, master's or research doctoral programs in the United States according to the CGS/GRE Survey of Graduate Enrollment and Degrees (Okahana et al., 2016). Institutions received a total of 2.18 million applications, with more than 1.3 million going to public institutions and nearly 834,000 going to private, not-for-profit institutions. Overall, from the applicants, 21.9% of doctoral applicants and 48.2% of master's/other applicants were accepted into programs. Private, not-for-profit institutions had a lower acceptance rate than public institutions.

Males accounted for 42.8% of first-time students enrolling in a graduate program in the fall of 2015, while women accounted for 57.2%. For public institutions, females represented 56.2% of new enrollment and for private, not-for-profit institutions, they represented 58.2%. For Research Universities [RU/VH], females accounted for 51.1% of enrolling first-time graduate students, while at Research Universities [RU/H], they accounted for 55.8%. At doctoral/research universities, males held just 36.2% of the seats and in master's college and universities and other institutions, they held 35.6% and 36.2% respectively (Okahana et al., 2016). The combined share of first time graduate students who were female among all races in underrepresented minority (URM) graduate students, 66.2%, was greater than that of white, non-Hispanic females at 60.6% when compared to their male cohorts. In some fields, URM females were particularly well

represented compared to non-URM females. URM females made up 52.7% of first-time graduate students in business, compared to 39.7% for White females (Okahana et al., 2016).

Graduate Degrees Awarded

Of graduate certificates, master's degrees, and research doctoral degrees awarded in 2015, 31.3% were awarded by private, not-for-profit institutions and 65.1% were awarded by public institutions. Of certificates, the vast majority were awarded in education at 33.6%. For field of study, education was the predominant choice for both males and female graduates. For master's degrees, business was the most awarded field with 21.3% followed by education at 20.1%. For both males and females, the most often chosen field of study was business. In research doctoral degrees, the health sciences were the most popular at 18.4%. For males, engineering was more popular, while females were awarded more degrees in health sciences (Okahana et al., 2016).

Of graduate certificates awarded, 22.3% were awarded at Research Universities [RU/VH], 22.8% were awarded at Research Universities [RU/H], 13.2% at doctoral/research universities, 39.3% at master's colleges and universities, and 2.5% at other institutions. Of master's degrees awarded, 36% were awarded at Research Universities [RU/VH], 19.3% were awarded at Research Universities [RU/H], 19.3% at doctoral/research universities, 29.2% at master's colleges and universities, and 2.3% at other institutions. Of research doctoral degrees awarded in 2015, 58% were awarded at Research Universities [RU/VH], 18.9% were awarded at Research Universities [RU/H], 10% at doctoral/research universities, 8.1% at master's colleges and universities, and 4.9% at other institutions (Okahana et al., 2016).

Application and Admission to Medical and Dental Schools

Application for admission to an allopathic medical school in the U.S. is made through the American Medical College Application Service (AMCAS), which is administered by the AAMC. AMCAS provides for both centralized testing, the Medical College Admissions Test (MCAT), and for completion of medical school applications. Institutions and applicants interact with this system throughout the admission cycle and continue to do so through matriculation (Dezee et al., 2012). Application for admission to an osteopathic medical school in the U.S. is made through the American Association of Colleges of Osteopathic Medicine Application Service (AACOMAS), which is administered by the American Association of Colleges of Osteopathic Medicine (AACOM). AACOM facilitates in the submission of MCAT scores and in the completion of applications. Institutions and applicants interact with this system throughout the admission cycle and continue to do so through matriculation (Dezee et al., 2012). The admission process for dental schools closely mirrors that of medical schools. Application is made through the Associated American Dental Schools Application Service (AADSAS), which is administered by the American Dental Education Association (ADEA). AADSAS administers the Dental Aptitude Test (DAT) and facilitates the full application and matriculation process for applicants to DDS and DMD programs in the United States (Garrison et al., 2013).

Bender, Burk, and Candito (2007) demonstrated that the gender of the interviewer in the application process had no effect on the likelihood of that individual subsequently enrolling in a dental school. Kondo and Judd (2000) examined the demographic composition of the admissions committees at dental schools. This study examined deans or directors of admissions at 85 U.S. dental schools and found that the male to female ratio on admission committees was 1.77 to 1. URMs accounted for 16% of the committee group participants. Research showed that while a

female presence on admission committees was common, it was lower than the percentage of female students enrolled. Gender concordances in the interview process, female representatives on the admissions committee, and programs to recruit generalists into the dental profession have not been demonstrated to affect enrollment by gender (Bender et al., 2007). Although some of the factors described do not affect enrollment by gender, differences exist in institutional characteristics that may explain disparities in enrollment by women.

The relationship between programs targeting medical students who expressed an interest in pursuing primary care practice was examined by Basco, Buchbinder, Duggan, and Wilson (1999). Of 120 schools surveyed, 25% had a generalist admissions committee chairperson, and 50% had more than 25% generalists on their admissions committee. Of these schools, 64% offered preferential admission to future generalists and 33% had recruitment activity targeting generalists. Based on the data obtained, they found that these targeted admissions practices had no effect on enrollment of underrepresented minorities or women (Basco et al., 1999).

Institutional Effects

The potential for institutional characteristics to have an effect on gender concordance was described by Hardy and Katsinas (2010). This study focused on associate degree completion rates in STEM (Science, Technology, Engineering, and Mathematics) fields and found that completion rates by women have increased over the last 20 years, and that the completion rates differed by institution type. Research showed that urban, suburban, and rural programs had vastly different funding capabilities for STEM programs. Students in rural programs were more likely to be dependent on financial aid, but these schools were also more likely to do a better job in providing scholarships and institutionally funded grants to first-time, full time, degree-seeking students than institutions in suburban and urban environments. The study confirms that the

differences in geographic locations and their ability to serve students are a factor in student success. As a feeder degree, access to STEM degrees for undergraduate education can be a heavy indicator of enrollment in graduate programs later in life. Mark et al. (2010) reviewed mentoring programs in four medical schools and found that the programs are perceived to improve opportunities for women to advance in the field and suggest that improvements in faculty mentoring may enhance medical education for women.

Institutional characteristics can influence enrollment by women. Female graduates of small colleges attend medical schools in greater numbers than those from larger colleges, however, it is important to note that graduates of small colleges who attend medical schools are more likely to drop out than students from larger colleges, 10.6% compared to 5.3% overall (Wheat, Brandon, Carter, Leeper, & Jackson, 2003). It was also noted that dental schools offering support programs for women enroll greater proportions of women than those that do not.

Matriculation and Enrollment

Data are available to describe the characteristics of students enrolled in professional education in the health science programs in the United States. The Association of American Medical Colleges published an extensive analysis of the individual characteristics of students entering medical school in 2014 (Association of American Medical Colleges, 2015). Based on the 2002-2003 study of enrollment in American medical schools, a recommendation was made, based on projected need, to increase the number of students enrolling each year in order to meet the growing demand for healthcare professionals in this country. The survey results suggest that by 2019-2020, enrollment will reach 21,304, only 130 positions short of the targeted 30% increase. This appears to conflict with the report on supply and demand published by the AAMC (2016), which projected there would be a greater shortage of physicians during this time frame.

According to the 2015 AAMC report, the number of schools that reported concerns regarding their number of clinical training sites increased 26% from 2010 to 2014. In 2014, 87% of respondents were concerned about the supply of primary care preceptors and the number of clinical training sites. The survey also shows that the number of institutions that either have or are planning to implement at least one initiative to increase interest in primary care has risen from 49% in 2009 to 75% in 2010 and remained above 70% in subsequent surveys. (AAMC, 2015).

As of 2002, there were 125 accredited MD-granting medical schools in the U.S. and in 2015 the Liaison Commission on Medical Education (LCME) granted full, provisional, or preliminary accreditation status to 16 additional schools bringing the total to 141 institutions for the 2014-2015 academic year. Additionally, the Commission on Osteopathic College Accreditation (COCA) lists 30 DO granting medical schools for the 2014-2015 academic year. For all medical schools accredited in the 2014-2015 academic year, enrollment totaled 20,343, a 23.4% increase of 2002 enrollment. Following current trends, enrollment is expected to continue to climb through 2019 (AAMC, 2015). The majority of this growth is expected from public institutions. Schools in the southern region will account for the largest increase, a projected 43%. When looking at enrollment projections for MD and DO students, the data show a projected increase of 49% in total enrollment by 2019. During the 2014-2015 academic year, there were 39,828 female medical school applicants and 45,306 male applicants. There were 47,177 White applicants followed next by 17,416 Asian students (AAMC, 2016a). When broken out by geographic region, the South, which includes Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, Virginia, and West Virginia, contributed the highest number of applicants with 17,854.

Over the past two decades, interest in dental education has steadily increased. From the 1989-1990 academic year until the 2012-2013 academic year, the number of applicants to dental schools has increased 137.4% with an average annual growth rate of 10.5%. Anderson, Duranleau, Garrison, and Valachovic (2015) researched the U.S. dental school applicants and enrollees for 2013 and the report offers a detailed analysis of trends in dental school enrollment. In 2013, there were 5,769 first-time, first-year enrollees, an increase of 1,535 from 2000. The study further breaks down enrollees by gender, noting that since 2000, the enrollment of women jumped 7% to 47.4%. There were 2,660 female enrollees in dental school in 2013 (Anderson et al., 2015). URM students comprised 13.8% of the overall applicant pool and their enrollment rate increased from 43% in 2012 to 46% in 2013. Most applicants had a competitive academic record with an average grade point average (GPA) of 3.25 for science and 3.36 overall. Seventy-three percent of applicants had a science GPA of 3.0 or better and 84% had a cumulative GPA score of 3.0 or better (Anderson et al., 2015).

Sewell, Hawley, Kingsley, O'Malley and Ancajas (2008) examined enrollment trends at a newly opened dental school at the University of Las Vegas. They discovered that, while the number of female students enrolled during the four years studied remained steady, it was also below the national average for female enrollment in similar institutions. Based on this study, the institution instituted new recruitment strategies for increasing their number of female and minority applicants and data from the subsequent admissions and recruitment cycle showed numbers higher than ever achieved in previous years.

In examining 2015 graduating dental students, Wanchek, Cook, Anderson, and Valachovic (2016) found the gender distribution to be fairly even for the 2015 graduating class, 47.9% of seniors were male and 47.1% female with 5% not reporting gender. When broken out

by race, the differences become starker. Among Whites, males accounted for 55.1% of seniors. In URM populations, however, the females were more heavily enrolled than males with Asian females accounting for 56% and Black/African American females representing 59.4%.

Graduation Rates

Professional programs in the health professions typically have extremely high graduation rates, which can primarily be attributed to their highly selective admissions criteria. The ultimate graduation rates for medical school has remained above 96% since the 1990s, but have shown some changes in other graduation rates, specifically 4-year and 8-year completion rates. (Caulfield et al., 2014). Ultimate graduation rates from dental schools are extremely high, above 95%, and have remained constant over the last decade (B. Cook, personal communication, April 13, 2017). Graduation rates are included in the NCES IPEDS data collection system. This survey component tracks given cohorts of full-time, first-time degree/certificate-seeking undergraduate students, at the normal, 150%, and 200% completion times. This survey does not collect data for students enrolling at the graduate or professional practice level (National Center for Educational Statistics, 2017a).

Even though the ultimate graduation rate from medical schools is high, only about 81% of graduates currently finish in four years. This is primarily the result of students enrolling in multiple degree programs, where students take time additional time to participate in joint Master of Public Health, Master of Business Administration, or Doctor of Philosophy programs. Students who are not continuously enrolled for personal reasons, such as medical leaves of absence, also account for a portion of those with a delayed graduation. Eight-year graduation rates may be used as a proxy to determine if a student ever graduates from medical school, as less than 0.1% of students who eventually graduate take more than eight years to complete their

degree programs. The four-year graduation rate from medical school dropped from 90% in the 1970s to 83% in the 1990s and has remained at or near this level. The five-year graduation rate has fallen from 97% to 94%; however, the eight-year graduation rate has only fallen from 98% to 97% (Caulfield et al., 2014).

Unlike the AAMC, the ADA does not publish graduation rates for dental schools in the United States. They do, however, report attrition data by class within their annual survey, which can be used to determine an approximate graduation rate though the use of longitudinal data (ADA, 2016). The 2010-2011 entering cohort had 5,170 enrollees and an attrition rate of 1.5%, which resulted in 5,092 students moving onto the second year. In 2011-12, this cohort experienced a 0.8% attrition rate, followed by 0.4% in 2012-2013 and 0.2% in 2013-2014. The cohort that entered U.S. dental schools in 2010-2011 contained 5,170 students, and 5031 students completed the program in four years yielding an approximate graduation rate of 97%. Over the past decade, this estimated graduation rate has remained between 95% and 97%. This does not take into consideration students who repeated a year or for other reasons delayed their graduation, so the ultimate graduation rate may be higher.

Barriers to Access and Societal Implications

Even as enrollment and degree completion by women has grown in the health professions, barriers to entry and eventual success in these fields still exist. Educational and financial barriers both have a real potential to inhibit women's ability to gain educational access. When examining these ideas and their implications on the broader population, the influence of these barriers to access become even more apparent.

Educational Barriers

Student preparation and undergraduate performance contribute to differences in enrollment by women in general and by women in the health professions. Ramsbottom-Lucier, Johnson, and Elam (1995) found that large differences exist in the preadmissions qualifications of medical school applicants based on their age and gender. Men scored higher on the MCAT at all age groups than women, but older women averaged higher GPAs than older men. They also found that these differences are much smaller when medical school performance is evaluated. Men performed better in year one, while women performed better during year four.

Haist, Wilson, Elam, Blue and Fosson (2000) studied the effects of both age and gender on the academic performance of medical students at the University of Kentucky. Of the students studied, the mean age of matriculation was 23.4 years and the age range was 19 to 43. Of the matriculants, 7.4% were URM, 2.4% were non-native of the U.S. who spoke English as their second language and 89.1% were in-state residents. Their research concluded that, once admitted, women perform better academically than men, and that older women perform better than younger men or women. While younger men scored higher on their MCATs and basic-science content learning, women performed better than men in clinical training and clerkships.

Hill, Corbett, and St. Rose (2010) identified that gender bias in the science, technology, engineering, and math fields, more commonly referred to as STEM, contributes to lower participation by women. As the majority of successful applicants to medical and dental schools seek undergraduate degrees in these fields, this may influence the number of women who subsequently enroll. Additional research in the STEM fields by Lott, Gardner, and Powers (2010) concluded that female and minority students are more likely to persist when surrounded by others like themselves.

Before 1950, Black medical students accounted for only two to three percent of total enrollment nationwide, and between 1950 and 1970 women represented between 6% and 11% of enrollment. From 1965 to 1985, with a massive expansion of the workforce underway, women and minorities entered medical education in historic numbers and that trend continues today (Greysen, Chen, and Mullan, 2011). This is important to take into account when looking at current admissions, enrollment, matriculations and graduations from medical education institutions.

Financial Barriers

One group that did not benefit during this time period was students of low socioeconomic status. In 1971, 27% of students came from families with that ranked in the lowest 40% of household incomes. By 1987, these students only accounted for 15% of enrollees and, in 2004, it was only 10% (Greysen et al., 2011). The rising cost of education and subsequent educational debt can be prohibitive for some prospective students. According to the AAMC (2016a), the median resident tuition for medical schools in the 2014-2015 academic year for public schools was $33,726 and for private schools, $53,616. For non-resident students, tuition rose to $59,140 for public institutions and $53,684 for private institutions. The total number of grants and scholarships awarded was $3.9 million, and over $2 billion dollars in loans were dispersed.

Both medical school and dental school graduates are faced with large debt upon completion of their education. When looking at indebtedness of medical school graduates, there is a discrepancy in the data reported by graduates and the data reported by the institutions. Medical graduates reported their educational debt, which includes pre-medical school and medical school debt, to average $183,152 in 2014-2015 with 36.4% holding more than $200,000 in debt. The school responses indicate 27.8% of graduates hold over $200,000 in educational debt (AAMC

2016a). When examining dental students and their total education indebtedness, in 2015, graduating seniors at public institutions had amassed on average $192,572 in debt, while their private institution counterparts were facing $264,364 (Wanchek et al., 2016). More than 33% of dental school graduates emerge with over $300,000 in debt. When looking at grants and scholarships, 52.1% of students received some form of assistance. Students are entering school with more undergraduate debt than ever before and, when compounded with rising tuition rates, these factors lead to economic conditions that can bring hardships on recent graduates and those looking to enroll.

Taking into account the large amount of debt that most medical students graduate with, pay equity is one of the largest barriers facing women in medicine today. In a survey of physicians leaving residency in New York State from 1999-2008, Lo Sasso, Richards, Chou, and Gerber (2011) analyzed compensation trends across genders. The study included 4,918 men and 3,315 women and participation by women trended upward throughout the survey to match with national employment trends. The data showed that starting salaries for female physicians were almost universally lower than for their male counterparts. The mean starting salary for males entering into solo practice was $182,937, for females, $139,530. When looking at group practice, males reported $195,781 in first-year income and females $162,538. Deeper study showed that many males also selected higher paying specialties such as internal medicine and emergency medicine, while many females tended to choose lower paying specialties such as pediatrics in higher numbers, but even in corresponding specialties, females were paid less than their male counterparts (Lo Sasso et al., 2011).

Nora et al. (2002) researched, through a questionnaire administered to 1,911 students, gender discrimination and sexual harassment in medical schools. While both men and women

both reported some exposure to sexual harassment and gender discrimination in academic contexts, the rates of incidence were much higher for women, 83%, than for men, 41%. This discrimination most frequently occurred during the third and fourth year clerkships. Men did, however, report observing, 70%, and hearing about, 81%, sexual harassment and gender discrimination in much closer proximity to the rates that women reported, 81% and 92%.

Societal Implications

Gender equity in the health professions is important to society. Patients may be more comfortable when treated by a health care professional of the same gender, and may provide a more honest and accurate description of their physical ailments. When looking at current medical professionals and their patient relationships, it is important to examine patient preference in medical practitioners. In a 2009 obstetrics and gynecology study of 500 patients, 220 patients had no preference and 194 patients preferred female obstetrician-gynecologists, while only 16 preferred male. (Makam et al., 2010). The reasons stated for preferring a female doctor were as follows: understands problems better (48%), issues of personal modesty (41%), unspecified reasons (6%), and religious reasons (5%).

Bender (2007) studied patient preference for a racially or gender-concordant student dentist and found race was generally non-related to overall preference. Forty percent of males and 45% of females in this sample did indicate an overall preference for a student provider. The total sample revealed no relationship between participant gender and expressing a preference. However, among the subjects with a preference, 71% of males and 78% of females chose a gender-concordant student dentist when given the choice of two equally qualified candidates. This indicates that, even if it is a subconscious decision, when placed in a position to make a choice between two equally qualified candidates, people are more likely to choose the candidate

most like themselves rather than a candidate to which they cannot closely relate. The three most common reasons cited for selecting a particular dentist were ‘no reason’ at 22%, females were perceived to have personal characteristics such as empathy, compassion, and attention to detail that appealed to patients, 18%, and the selected student was like the patient in some way, 14%. Twelve percent reported that gender was the primary motivation for their choice, but no participant specifically reported race as a factor (Bender, 2007).

When surveyed in 2015, American Indian or Alaskan Native students reported that they were more likely to work in a rural community to small town, 20% and 33.3%, than an urban environment, 13.3%. Black/African American graduates were more likely to work on the urban fringe, 26.9%, than in rural communities, 4.3%, while White graduates reported a likelihood of working in mid-sized cities, 27%, over the inner city, 7.7% (Wanchek et al., 2016). The communities in which these emerging dentists chose to set up their practices have real-life implications for the future of American dental health. If dentists are unwilling or unmotivated to move to underserved communities, dental health care access will continue to decrease and overall health care will decline.

The future of any specialty is dependent on attracting the most qualified students possible. When studying gender trends among anesthesiology residents, Rose, Burkle, and Elliott (2006) found that in 2004, 42% of all residents enrolled in training programs were female, but only 28% of anesthesiology residents were female. Orthopedic surgery, 10%, general surgery, 27%, and emergency medicine, 34%, were all specialties that fell below the average in the number of female residents. Rose et al. (2006) note the lack of interaction in pre-clerkship medical curriculum with gender-concordant mentors as a possible reason for the low number of women in these fields. With a lack of personal advisors, mentors, and faculty in these fields,

women choose specialties in which they have greater interaction with instructors, leaders, mentors, and faculty that they can relate to, such as obstetrics and gynecology, 75%, and pediatrics, 69%.

Gender specific communication problems in the patient-provider relationship may also lead patients to seek out physicians of the same gender (Verdonk, Benschop, de Haes, & Lagro-Janssen, 2008). This research shows that there are contrasts in the presentation of health complaints and symptoms by gender. Women are more likely to refer to the social context of the complaint than male patients and men refer to their bodies more often in terms of a technical device. In this analysis, it was found that some male physicians had negative attitudes towards female patients, viewing them as too demanding, that they seek too much information, and communicate in a diffuse way. Males, on the other hand, were described as succinct, sometimes overly so. Female health conditions were often attributed to uncontrollable or unchangeable factors such as biology, whereas the same conditions in men where more often contributed to changeable factors like behavior.

Tsugawa et al. (2017) studied 1,583,028 hospitalizations for 30-day mortality rates. Of the patients, 621,412 were male and 961,616 were female, with a median patient age of 80.2 years. They also studied 1,540,797 hospitalizations that were used in the analysis of readmission rates. Of those, the median patient age was 80.1 years and 602,115 patients were male and 938,682 were female. In this study, patients treated by a female physician had a lower 30-day mortality rate, 11.07% to 11.49%, and a lower 30-day readmission rate, 15.02% to 15.57%, than patients cared for by male physicians. The study also showed that the female physicians, who numbered 18,751, were younger than their male counterparts, who numbered 39,593, by an average of 5 years, and were more likely to have osteopathic training. Females were more likely

to work in large, non-profit, major teaching hospitals than their male counterparts were. These data show that practice methods can have important clinical implications for patients (Tsugawa et al., 2017).

Curricular trends in professional education are frequently influenced by needs in the workforce. The health professions are now reacting to the need for increased collaboration through the development of interprofessional education (IPE). This includes the professions of medicine and dentistry where the walls between them in clinical practice are being broken down in favor of cooperative learning experiences. Academic health science centers are currently restructuring the silo approach to include more interprofessional experiences in their curricula, and accrediting agencies are adding IPE experiences to their accreditation standards (Formicola et al., 2012).

Conceptual Framework

Biases are inherent in each and every individual; it is how they recognize and deal with those biases that can shape society as a whole. Biases and social stereotypes from the past still exist, and they contribute to a culture that perpetuates inequalities today. Gender, racial, and religious stereotypes are alive and well and, for many, bring isolation and exclusion (Tucker, 2015). In order to actively work to prevent biases against certain groups of people, one must understand the origins of said behaviors and how they morph into discrimination. Discrimination on the basis of one's sex, race, sexual orientation, gender, socioeconomic status, disability, religion, or ethnicity is harmful to the advancement of a civil society. Higher education institutions have been described as microcosms of society that contribute to cultural norms and help to shape our social structure (Allan, 2011). Institutions of higher learning that allow biases, discrimination, and stereotypes to become part of their institutional culture are ultimately

responsible for percolating these ideas out into society as a whole. Patriarchy or dominating masculinity is still experienced and felt in higher education, even with the massive strides that women have made over the last 50 years (David, 2015).

The conceptual framework for this study focused on female degree production in medical and dental schools and how institutional characteristics can be used to explain differences between institutions. Previous studies have investigated the relationships between various student factors and institutional characteristics. Wanchek et al. (2016) found that institutional control was related to overall debt load when comparing graduates of public and private dental schools. Projected changes in enrollment patterns in medical schools by geographic region were made by the AAMC (2015) based upon current enrollment trends. The degree of urbanization as an institutional characteristic and its relationship to associate's degree production in STEM-related fields was reported by Hardy and Katsinas (2010). In a decade long longitudinal study of graduate enrollment and degree production, Okahana (2016) identified differences that existed based upon an institution's Carnegie classification, minority enrollment, and female enrollment. Wheat, Brandon, Carter, Leeper, and Jackson (2003) noted that the institutional size of the college a student attended for premedical training was a factor in medical school success. Tsugawa et al. (2017) studied how patient outcomes differed when treated by either male or female physicians when adjusted for hospital fixed effects.

Even though the gap in degree completion between men and women has narrowed (Wilson, Zozula, and Gove, 2010), unequal representation of students by gender persists at specific institutions. This framework aims to address the fundamental source of differential degree completion by gender. This study is not intended to determine the underlying causes of gender bias; it seeks to identify institutional characteristics that explain the differences. In

exploring institutional characteristics to measure their influence on degree completion across genders in medicine and dentistry and later combining the variables, the researcher will provide insight into characteristics that influence degree production and how interrelationships among these factors may exacerbate this trend.

Summary

This chapter has reviewed relevant literature for the study. It began by describing the current professional climate and industry trends in professional programs in medicine and dentistry. The sections that followed delved into enrollment perspectives and an examination into the barriers to access and societal implications of female participation, or lack of, in these programs. The final section described the conceptual framework for the study.

This review has identified a gap in the literature. Several researches have used large data sets, such as the NCES' IPEDS, to investigate how institutional characteristics can affect enrollment and degree attainment. The discipline specific professional associations (AMA and the ADEA) regularly survey their members and publish reports on their findings related to enrollment and gender; however, there is no indication that the methodology is consistent. The published research in the professions of medicine and dentistry remain highly siloed by discipline, even though the pathway to entry and the educational experiences in these careers is quite similar. No studies were found that utilized large national, publicly available datasets to compare degree production, by gender, across both medical and dental institutions.

In Chapter III, the methodology for the study is discussed. This will include discussions on research approach, intent of the study, research design, study population, data source and data acquisition, data security and ethical considerations, variables of interest, data analysis, and researcher positionality.

CHAPTER III:

METHODOLOGY

Introduction and Research Approach

In order to adequately discuss institutional characteristics that influence degree production across gender lines, one must first define sex and gender and discuss the importance of the distinctions between the two terms in data collection. All too often, the words are used interchangeably and without adequate explanation of the implications of doing so.

Sex is defined as either of the two main categories (male and female) into which humans and most other living things are divided based on the basis of their reproductive functions (Oxford English Dictionary, 2017a). As Oakley (2015) points out, the differences in sex are biological; a visible, physical difference that allows us to separate people into two basic, but distinct groups. It is the gendering of behaviors and personality traits that makes life much more complex. Gender is a more abstract social construct. Gender is defined as the state of being male or female, typically used with reference to social and cultural discrepancies rather than biological ones (Oxford English Dictionary, 2017b). It is more accurately described as the range of characteristics pertaining to, and differentiating between, the masculine and feminine (Udry, 1994). This may or may not include biological sex, gender roles, or gender identity. With stark variation in definition, it is important to keep in mind the implication of the words chosen to use to describe an individual. Individuals of any sex can identify at any place on the gender spectrum. More feminine presenting males are often stigmatized, while more masculine presenting women are also often referred to in negative or derogatory ways (Haig, 2004). When

humans step outside of the gender roles that society has conditioned the general population to see as the relative norm that a person of their perceived sex should fall into, that person is often met with judgement and criticism (WHO, 2017). Given that gender is based on not only social and cultural differences, but also the individual's view of oneself, discussion of gender expression is also pertinent. The Gill Foundation (2017) defines gender expression as the ways in which each person manifests their masculinity or femininity. Speech, appearance, clothing, and body language all play a part in an individual's gender identity and how they identify themselves. It is important to keep in mind that gender expression is not always based on the ones biological sex and that gender expression is not a constant, nor is it always linear.

When data are collected at an institutional level, one must examine two factors; how the data are requested and how the data are collected. At postsecondary institutions, data such as an applicant's race, gender, and ethnicity are self-reported on admissions forms and are not independently verified. It is important to note that in the higher education institutions studied, the words sex and gender are sometimes used interchangeably to describe the student's preferred gender expression.

All medical and dental schools in the U.S. currently utilize centralized application systems as the initial entry point for individuals into the application pipeline, and require prospective applicants to self-identify certain demographic characteristics. AMCAS requires applicants to allopathic medical schools to identify their sex as either male, female, or decline to answer. In 2017, this application system also began provide applicants with the opportunity to optionally identify their gender as male, female, trans male/trans man, trans female/trans woman, genderqueer/gender non-conforming, or different identity (please state) (Association of American Medical Colleges, 2017c). AACOMAS requires applicants to osteopathic medical

schools to identify their gender as either male, female, or decline to state (American Association of Colleges of Osteopathic Medicine, 2017). Dental school applicants applying through ADEA AADSAS are required to identify their gender as either male, female, or decline to state (American Dental Education Association, 2017). These self-reported values may be further recoded as they are entered into and maintained within an institution's electronic student information system. For example, in PeopleSoft®, one of the leading student information systems, the background labels in the coding for the field requesting this piece of information from the student is shown as "sex." On the student facing profile, however, many institutions have altered the field name to reflect the word "gender." Even in doing this, many of these institutions have made male and female the only available choices, even though the coding in the software allows for a greater variation in data collection.

The reporting data available to study this information should also be examined. IPEDS (Integrated Postsecondary Educations Data System), a program of the NCES (National Center for Education Statistics), which is managed by the U.S. Department of Education, is the central repository for reported statistics for postsecondary institutions in the U.S. The data provided to IPEDS is supplied by individual institutions and some of the data reported includes categories such as gender and ethnicity which were originally self-reported by the student to the institution. This has meaning for this analysis in several ways. First, IPEDS, the federally mandated system of interrelated educational surveys containing a wide range of institutional and aggregated student and personnel data, is using the word gender in their reporting in place of the word "sex," even though they are limiting their scope of "gender" or gender expression to only the binary option of men or women. Given the fact that IPEDS data collection and analysis is the basis for the research for this study, their definition of gender is used throughout this analysis for

continuity. Secondly, the data being reported to IPEDS is self-reported, or in some cases may have been intentionally left blank by the student at the time of application. This means that in order to accurately study the characteristics that explain gender differences, one must also take into account gender expression in these statistics rather than looking at them as solely a representation of biological sex.

This study uses quantitative research methods to analyze existing data sets in order to identify institutional characteristics that may contribute to differences in the distribution by gender of the degrees Doctor of Medicine or Doctor of Osteopathy and Doctor of Dental Surgery or Doctor of Medicine in Dentistry. Quantitative research tests theories by analyzing the relationship between variables. This relationship is then translated into numerical data that can then be further analyzed. This chapter will outline the methods used in this study and starts with a rationale for the study and a brief context for utilizing this approach for analysis. It is followed by the research questions and sections that address variables and data analysis methods, as well as discussing data and ethical concerns.

Intent of Study

The intent of this study is to determine if institutional characteristics affect degree production based on gender. The study focused on medical school graduates, both those graduating with Doctor of Medicine and Doctor of Osteopathy degrees, and dental school graduates receiving either a Doctor of Dental Surgery or Doctor of Medicine in Dentistry degree.

The schools of medicine in this study may award degrees of either Doctor of Medicine of Doctor of Osteopathy. The CIP code for Doctor of Medicine is 51.1201 and the CIP code for Doctor of Osteopathy is 51.1901. The schools of dentistry in this study may award degrees of either Doctor of Dental Surgery or Doctor of Medicine in Dentistry. Both of these degrees are

awarded under CIP code 51.0401 and are considered interchangeable for the purposes of this study.

Research Questions

1. What is the distribution of medical degrees conferred by gender based upon these characteristics?

- Control of institution
- BEA regions
- Degree of urbanization
- basic Carnegie classification
- Institution has a hospital
- Institution size category

2. What is the distribution of dental degrees conferred by gender based upon these characteristics?

- Control of institution
- BEA regions
- Degree of urbanization
- basic Carnegie classification
- Institution has a hospital
- Institution size category

3. What combination of institutional characteristics best explains differences in the percentage of medical degrees conferred to females?

4. What combination of institutional characteristics best explains differences in the percentage of dental degrees conferred to females?

5. What differences, if any, exist between the characteristics affecting medical degree production and those affecting dental degree production?

Research Design

Study Population

This study focused exclusively on institutions that award doctoral level professional degrees in the health professions. Specifically, only institutions that award degrees in medicine (MD or DO) or dentistry (DDS or DMD), and report data to NCES IPEDS, were included in this analysis. Institutions may offer only one professional degree and several offer a combination of these degrees. This study utilized the entire population for data analysis. A list of institutions included in the study is included in Appendix A. A summary is included in Table 2.

Table 2

Institutions Awarding Medical or Dental Degrees in 2014-2015

Degree Awarded	Number of Institutions
Medicine only (MD)	82
Medicine only (DO)	20
Both MD and DO	1
Dentistry only (DDS or DMD)	6
Medicine (MD or DO) and Dentistry (DDS or DMD)	60

Data Source: NCES, IPEDS, 2017

Data Source and Data Acquisition

Congress has mandated that the U.S. Department of Education collect, collate, analyze, and report full and complete statistics on the condition of education in the United States. In addition, the Department of Education must conduct and publish reports and specialized analysis of the meaning and significance of such statistics. To meet this mandate, the NCES makes the IPEDS data publically available to provide this information for public colleges and universities. All higher education institutions that receive Title IV funding in accordance with the Higher

Education Act of 1965, as amended, for student aid are required to provide timely and accurate data to IPEDS (National Center for Educational Statistics, 2017a).

IPEDS is a series of 12 surveys covering nine major areas, each of which have different data collection and release cycles. For the purposes of this study, the following surveys were used: Institutional Characteristics, Fall Enrollment, and Completions. Data for the Institutional Characteristics survey are collected annually in the fall. This survey contains general information about institutions, such as the institutional mission statement, information on veteran's services, student services, student charges, athletic affiliations, and academic calendar systems. The Completions survey is an annual survey in which data are collected in the fall. This survey provides information about degrees awarded during the academic year, such as Classification of Instructional Program (CIP) code, race, ethnicity, gender, and age. The Fall Enrollment survey is an annual survey in which data are collected in the spring. This survey collects student enrollment counts by level of student, enrollment status, gender and race/ethnicity. In addition, first-time student retention rates and the student-to-faculty ratio are collected. Every other year data on residence of first-time undergraduates is required and in opposite years, enrollment by student age is required to be reported. For all surveys, data are publically released about one year after data collection ends (Integrated Postsecondary Education Data System, 2017a). IPEDS data have previously been used to investigate institutional characteristics and gender in higher education studies (Hardy & Katsinas, 2010).

Data was extracted from the National Center for Education Statistics (NCES) Integrated Postsecondary Data System (IPEDS) reports on Institutional Characteristics and Completions. Completion data for only the students for which degrees were awarded with the associated CIP codes of 51.1201 medicine and 51.1901 osteopathic medicine and 51.0401 dentistry were used in

this study. The recording of a student's gender by professional schools is not required, and data coded as "not indicated" were excluded from the analysis. Publicly released IPEDS data are available as both provisional and final release. The final release trails the provisional release by about one year, and includes revisions to the provisional release data that were made by institutions during the subsequent data collection year. Final data are released about two years after the initial data collection. The data from the most recent final release for all surveys, collection period 2014-2015, was used in this study.

Data Security and Ethical Considerations

Human subjects were not used in the research and all data used in the analysis was obtained from the publically accessible IPEDS dataset, so data security procedures were not be applicable.

This study was conducted as a secondary data review and was determined to be exempt from Institutional Review Board (IRB) approval. Personal communication with the Office of Sponsored Programs at the University of Alabama has confirmed that NCES IPEDS is an approved database with exempt status, and previous studies utilizing this dataset have been previously been approved for secondary analysis. The researcher provided written notification to the IRB of the intent to use this dataset for this study, and a written determination of the exempt status of this study was received. The IRB approval letter is included in Appendix C of the dissertation.

Variables of Interest

All variables used in this study are included in the NCES IPEDS dataset. A full list of variables and their concise descriptions are contained in the Data Dictionary in Appendix B. The variables are also presented here along with a brief explanation of each. In addition, a table is

included to match each research question with the variables used to answer the question. The operational definitions for this study are as follows.

1. *Unit ID.* Unique identification number assigned to postsecondary institutions surveyed through the Integrated Postsecondary Education Data System (IPEDS). Also referred to as UNITID or IPEDS ID. The number was used to identify unique institutions across surveys (NCES, 2017b).
2. *CIP code*. A six-digit code in the form nn.nnnn that identifies instructional program specialties within educational institutions. This taxonomic coding scheme for secondary and postsecondary instructional programs is intended to facilitate the organization, collection, and reporting of program data using classifications that capture the majority of reportable data through NCES. The CIP is the accepted federal government statistical standard on instructional program classifications and is used in a variety of education information surveys and databases (NCES, 2017b).
3. *Year*. The academic year to be considered for study is 2014-2015. Data from only the surveys associated with this academic year was used in this analysis (NCES, 2017b).
4. *Gender.* Gender is measured by the binary variables of men or women. IPEDS Completers data are separated by gender and by CIP code (NCES, 2017b).
5. *Percentage of female completers.* The percentage of program completers in a specific CIP code as reported by the institution as women in the institutional characteristics survey.
6. *Control of Institution.* A classification of whether an institution is operated by publicly elected or appointed officials (public control) or by privately elected or appointed officials and derives its major source of funds from private sources (private control).

Privately controlled institutions are further categorized as either for profit or not-for-profit (NCES, 2017b).

7. *BEA region.* Bureau of Economic Analysis Regions are a set of eight geographic areas that are aggregations of the states which were developed in the mid-1950s and are based on the homogeneity of the states in terms of economic characteristics, such as the industrial composition of the labor force, and in terms of demographic, social, and cultural characteristics (NCES, 2017b).
8. *Degree of urbanization.* Local codes used to identify the geographic status of a school on an urban continuum which are based on a school's physical address and assigned through a methodology developed by the U.S. Census Bureau's Population Division in 2005 (NCES, 2017b).
9. *Basic Carnegie classification.* The 2010 Carnegie classification includes all colleges and universities in the United States that are degree-granting and accredited by an agency recognized by the U.S. Secretary of Education (NCES, 2017b).
10. *Institution has a hospital*. A derived value in the IPEDS dataset which indicates whether the institution has a hospital as indicated by data reported in the Finance Survey (NCES, 2017b).
11. *Institution size category*. A derived value in the IPEDS dataset which places institutions into one of five size bands based upon total students enrolled for credit in the fall term (NCES, 2017b).
12. *Percentage of minority students.* The percentage of students identified by the institution as either American Indian or Alaskan Native, Asian, Black or African American,

Hispanic, Native Hawaiian or other Pacific Islander, or two or more races in the fall enrollment survey (NCES, 2017b).

13. *Percentage of female students.* The percentage of students identified by the institution as women in the fall enrollment survey (NCES, 2017b).

Table 3

Research Questions and Variables of Interest

Research Question	**Dependent Variable**	**Independent Variable**	**Test Statistic**
1. What is the distribution of medical degrees conferred by gender based upon these characteristics? • Control of institution • BEA region • Degree of urbanization • basic Carnegie classification • Institution has a hospital • Institution size category	Percentage of female completers	Control of institution, BEA regions, urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category	descriptive

Research Question	Dependent Variable	Independent Variable	Test Statistic
2. What is the distribution of dental degrees conferred by gender based upon these characteristics? • Control of institution • BEA region • Degree of urbanization • basic Carnegie classification • Institution has a hospital • Institution size category	Percentage of female completers	Control of institution, BEA regions, urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category	descriptive
3. What combination of institutional characteristics best explains difference in the percentage of medical degrees conferred to females?	Percentage of female completers	Control of institution, BEA regions, urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category, percentage minority enrollment, percentage female enrollment	OLS regression
4. What combination of institutional characteristics best explains difference in the percentage of dental degrees conferred to females?	Percentage of female completers	Control of institution, BEA regions, urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category, percentage minority enrollment, percentage female enrollment	OLS regression
5. What differences, if any, exist between the characteristics affecting medical degree production and those affecting dental degree production?	Percentage of female completers	Control of institution, BEA regions, urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category, percentage minority enrollment, percentage female enrollment	none

Data Analysis

This study used both descriptive and inferential statistics in the analysis of the data. Data for medical and dental schools was analyzed separately. Descriptive statistics used variables or combinations of variables to describe the population. Inferential statistics were used to test hypotheses about differences in populations based upon measurements made (Tabachnick & Fidell 2013, p.7). Descriptive statistics were used to illustrate the populations included in this study, and to provide clarification of the current state of gender in the professional programs that are included in the analysis. The inferential statistical method ordinary least squares (OLS) regression was used to identify if institutional characteristics can be used to explain differences in degree completions by gender. Tabachnick and Fidell (2013) state that "For most data sets, there is more than one appropriate analytical strategy" (p. 922). The statistical methods that were used in this study were selected on the basis that they can provide the best interpretation of the relationships among the variables of interest. The data analyses made inferences based upon the entire population rather than a representative sample.

Customized data sets were generated from the IPEDS Data Center and contained specific data on the variables of interest. The response rate to this survey is extremely high and the analysis includes the entire institutional population of interest. Given that the data to be analyzed includes the entire population, further sampling of the selected data are not appropriate. The extracted data were downloaded as a CSV file and then imported into Microsoft Excel. These data were then imported and analyzed using the IBM Statistical Package for the Social Sciences version 24. The records were classified by control of institution, BEA regions, degree of urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category, minority enrollment, and female enrollment. Descriptive statistics were used to analyze

institutional characteristics separately for medical and dental schools. An analysis of the effects of all institutional characteristics and their influences upon one another was performed using an ordinary least square (OLS) regression.

Researcher Positionality

Even though this study was completed as a quantitative analysis, a potential still existed for past experiences of the researcher to influence the data and methods used as well as the interpretation of the findings of the study. The researcher has a background in higher education, with over 30 years of experience in academic administration and instruction at an academic health sciences center. In addition, at the time of the study, the researcher was responsible for student record keeping, graduation and the submission of portions of the IPEDS surveys at their institution. The researcher's institution was included in the data set. In recognizing the potential for bias, the researcher actively sought to maintain objectivity throughout this project. This objectivity was maintained by using data collected from a publicly available database and the research questions were posed and answered in a quantitative rather than a qualitative manner. Results reported in this analysis are based on statistical analysis, and the quantitative nature of the study helped to mitigate bias.

Summary

The purpose of this quantitative research study was to explore institutional characteristics that influence degree production in medical and dental schools by gender. This study filled a gap in existing literature by looking at the corollary relationship that institutional characteristics such as control of institution, BEA regions, degree of urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category, minority enrollment, and female enrollment can have on degree production by gender.

This chapter has provided an overview of the research approach used and the methodology behind the study. The study population, data sources, and an in-depth look at the variables of interest were also included. The research questions that were first outlined in Chapter 1 were also revisited, as were the techniques that were used to answer each described. Additionally, data confidentiality and security, as well as researcher positionality, questions were answered. Chapter IV will report the findings of this study.

CHAPTER IV:

RESULTS

Introduction

The purpose of this study was to determine if institutional characteristics can be used to explain differences in the proportion of degrees awarded to women in the professional programs of medicine and dentistry. The format of the chapter follows a question-by-question analysis of research questions one through five followed by a summary. Utilizing information contained in a large publicly accessible database, the researcher investigated specific characteristics which may account for differences in the percentage of females that earn degrees at these institutions. The institutional characteristics considered were control of institution, BEA region, degree of urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category, percentage of minority enrollment and percentage of female enrollment. The results are presented in two sections. The first section contains a profile of the study population, including both students and institutions. The second section contains the data analysis and a review of how it relates to each research question.

Study Population

This study utilized the entire population of students who were awarded degrees in the specified fields during the IPEDS NCES reporting year. IPEDS final reporting data from the 2014-2015 academic year was used for this statistical analysis. All institutions awarding degrees to students in the fields of medicine (MD or DO) and dentistry (DDS or DMD) during the IPEDS

NCES reporting year were included. Sampling methods were not used, as the entire population was included in the analysis. IPEDS NCES data was extracted from three institutional surveys; institutional characteristics, completers, and human resources. The data extracted from IPEDS NCES showed that the frequency each of the variable values occurred in the data set and the proportion of the population that this variable value represented.

The number of institutions offering medical or dental programs in the complete data set was 168. Of these institutions, six institutions reported a value of zero for completers in both medicine and dentistry. These institutions all began offering professionals degrees under the CIP codes included in this study less than four years prior to the survey period. Since these professional programs have a normal completion time of four years, these institutions were too new to be able to report complete data. Given that these institutions failed to report data that this analysis is using as either a dependent or independent variable, or in some cases both, they have been removed from the final analysis. Of the institutions included, 156 reported completers in medical programs and 62 reported completers in dental programs with 56 institutions reporting completers in both. Institutions that provided incomplete reporting data remain in the institutional characteristics survey analysis that follows.

Variables

The percent of female degree completers for medical programs was calculated by dividing the total number of female completers by the total number of completers. There were no instances where gender was not reported by the institution. The range extends from 32.43% to 70.97% (N=156, M=47.54, SD=5.86). The frequency distribution for these percentages is shown in Figure 1.

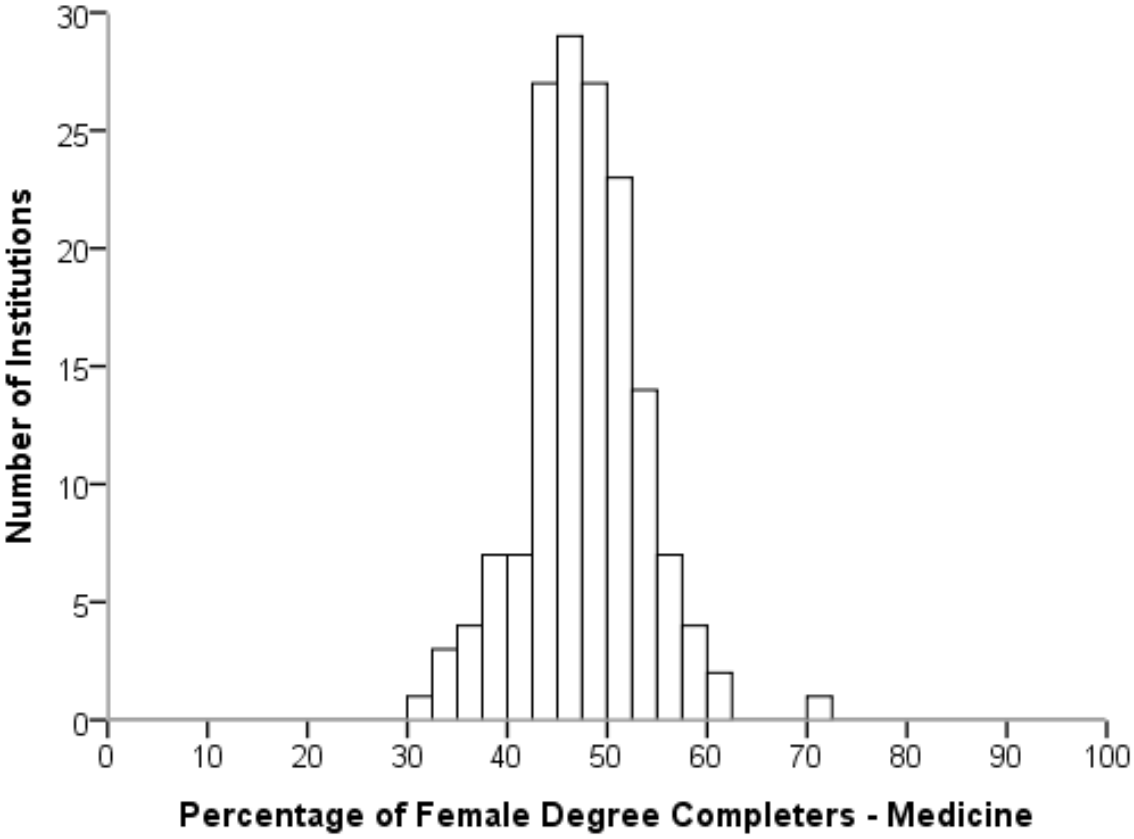

Figure 1. Percentage of medical degrees (MD or DO) awarded to female completers at U.S. institutions during the 2014-2015 academic year.

The percentage of female degree completers for dental programs was calculated by dividing the total number of female completers by the total number of completers. There were no instances where gender was not reported by the institution. The range from 35.29% to 79.37% (N=62, M=52.82, SD=9.27). The frequency distribution for these percentages is shown in Figure 2.

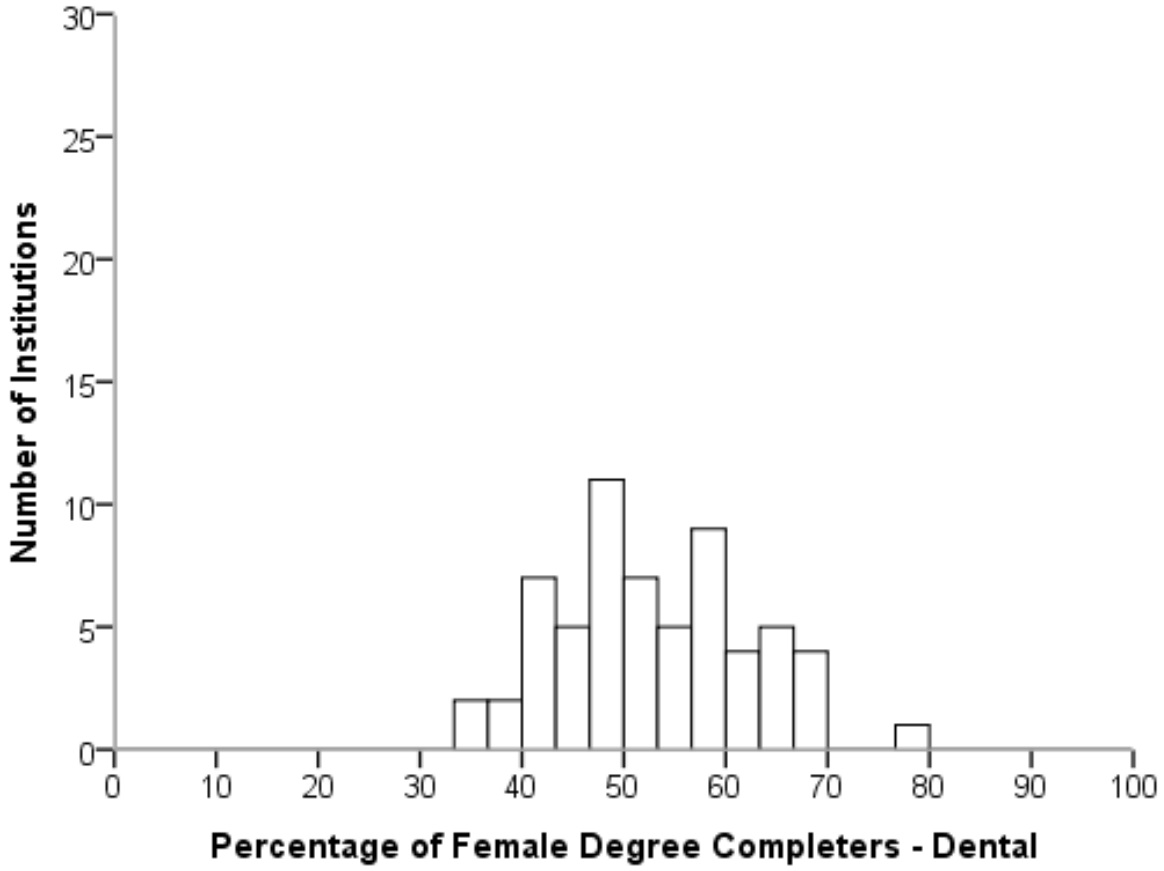

Figure 2. Percentage of dental degrees (DDS or DMD) awarded to female completers at U.S. institutions during the 2014-2015 academic year.

The first dependent variable examined was control of institution, which is reported in IPEDS as the variable CONTROL. Institutions identified as public operate under the governance of publically elected or appointed individuals and generally receive some of their funding from state and local government sources. Institutions under private control operate primarily without government subsidies and without coordination or governance from at the state or local political level. Within private control institutions, there are those that are considered private not-for-profit and private for-profit. Private not-for-profit institutions receive no compensation other than standard business expenses, while private for-profit institutions seek to create a profit.

In Table 4, the frequency of each type of institution in the study, as well as their percentage of the overall population is listed. Based on the 168 institutions studied, there were more institutions under public control and they held 53% of the institutions analyzed.

Table 4

Control of Institution (CONTROL)

IPEDS Value	Type of Control	Frequency	Percent
1	Public	89	53.0
2	Private not-for-profit	77	45.8
3	Private for-profit	1	0.6
	Total	167	99.4
Missing	System	1	0.6
Total		168	100.0

The study also analyzed the Bureau of Economic Analysis (BEA) regions, reported as OBEREG in the IPEDS NCES dataset. OBEREG is a set of geographic areas, and are rough regional classifications that were developed in that 1950s and are based on the homogeneity of the states when examining factors such as the economic, demographic, social, and cultural characteristics of each state. In Table 5, shows that most institutions offering professional programs in the health sciences are in the Southeast region, which represented 42 institutions and 25% of the total study population. The Rocky Mountain and Outlying Areas regions each had only 4 institutions, just 2.4%, the smallest percentage in the analysis.

Table 5

Bureau of Economic Analysis (BEA) regions (OBEREG)

IPEDS Value	Region	Frequency	Percent
1	New England – CT, ME, MA, NH, RI, VT	11	6.6
2	Mid East – DE, DC, MD, NJ, NY, PA	31	18.5
3	Great Lakes – IL, IN, MI, OH, WI	26	15.5
4	Plains – IA, KS, MN, MO, NE, ND, SD	16	9.5
5	Southeast – AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, WV	42	25.0
6	Southwest – AZ, MN, OK, TX	13	7.7
7	Rocky Mountains – CO, ID, MT, UT, WY	4	2.4
8	Far West – AK, CA, HI, NV, OR, WA	20	11.9
9	Outlying Areas – AS, FM, GU, MH, MP, PR, PW, VI	4	2.4
	Total	167	99.4
Missing	System	1	0.6
Total		168	100.0

Degree of Urbanization, LOCALE, is representative of the degree of urbanization of an institution based upon the population of the institution's location. This was developed by the U.S. Census Bureau's Population Division in 2005. In Table 6, the data show that most institutions are located in large cities. Midsize cities, small cities, and large suburbs host the majority of institutions. Relatively few institutions operate in other areas.

Table 6

Degree of Urbanization (LOCALE)

IPEDS Value	Region	Frequency	Percent
11	City: Large	66	39.3
12	City: Midsize	33	19.6
13	City: Small	24	14.3
21	Suburb: Large	30	17.9
22	Suburb: Midsize	2	1.2
23	Suburb: Small	1	0.6
31	Town: Fringe	1	0.6
32	Town: Distant	5	3.0
33	Town: Remote	4	2.4
41	Rural: Fringe	1	0.6
	Total	167	99.4
Missing	System	1	0.6
Total		168	100.0

The Carnegie Foundation created their classification system in 1973 with the purpose of being able to examine and compare comparable educational institutions. There are 33 basic Carnegie classifications in the 2010 version, with the variable listed as CCBASIC in the IPEDS NCES data set. This study examined only the 10 classifications that institutions granting degrees in the medicine and dentistry were classified within and the relationship between these classifications and the proportion of degrees awarded to females. Most institutions in this study reported as Research Universities (very high research activity), with 63 institutions and 37.5% of the institutions studied. The second largest number of institutions studied are those in the classification medical schools and medical centers with 48 institutions and 28.6% of institutions studied, followed by Research Universities (high research activity), with 25 institution and 14.9%. The remaining institutions comprise the other seven classifications. This can be seen in Table 7.

Table 7

2010 basic Carnegie Classification (CCBASIC)

IPEDS Value	Basic Classification	Frequency	Percent
13	Associate's – Private not-for-profit, 4-year, primarily Associate's	3	1.8
15	Research Universities (very high research activity)	63	37.5
16	Research Universities (high research activity)	25	14.9
17	Doctoral/Research Universities	6	3.6
18	Master's Colleges and Universities (larger programs)	12	7.1
19	Master's Colleges and Universities (medium programs)	1	0.6
21	Baccalaureate Colleges – Arts & Sciences	1	0.6
22	Baccalaureate Colleges – Diverse Fields	1	0.6
25	Medical Schools and medical centers	48	28.6
26	Other health professions schools	1	0.6
-3	Not applicable, not in Carnegie Universe (not accredited or non-degree granting)	6	3.6
	Total	167	99.4
Missing	System	1	0.6
Total		168	100.0

This study also examined whether or not the institution has a hospital influenced the proportion of degrees awarded by gender for medical or dental degrees. In the IPEDS NCES database, institutions report whether or not they have a hospital and these data are shown in Table 8. Of institutions studied, most did not have a hospital, as only 66 institutions, or 39.3%, reported having a hospital.

Table 8

Institution has a hospital (HOSPITAL)

IPEDS Value	Hospital	Frequency	Percent
1	Yes	66	39.3
2	No	99	58.9
-2	Not Applicable	2	1.2
	Total	167	99.4
Missing	System	1	0.06
Total		168	100

Institution size category used to examine institutional characteristics that could possibly affect the proportion of degrees awarded to females. As shown in Table 9, there are a relatively small number of institutions with student populations in the under 1,000 student and 5,000-9,999 range. Over 82% of institutions have 1,000-4,999 students, 10,000-19,999 students or 20,000 students or more.

Table 9

Institution Size Category (INSTSIZE)

IPEDS Value	Size	Frequency	Percent
1	Under 1,000	17	10.1
2	1,000-4,999	44	26.2
3	5,000-9,999	12	7.1
4	10,000-19,999	35	20.8
5	20,000 and above	59	35.1
	Total	167	99.4
Missing	System	1	0.6
Total		168	100.0

The percentage of minority enrollment at institutions offering medical and dental programs was calculated by dividing the total number of minority students enrolled at the institution by the total number of enrolled students. Minority students are those that identified their race/ethnicity as American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, Hispanic/Latino, or two or more races. There were no instances where race/ethnicity was not reported by the institution. The range extends from 10.0% to 99.0% (N=168, M=32.50, SD=18.13). The frequency distribution for these percentages is shown in Figure 3.

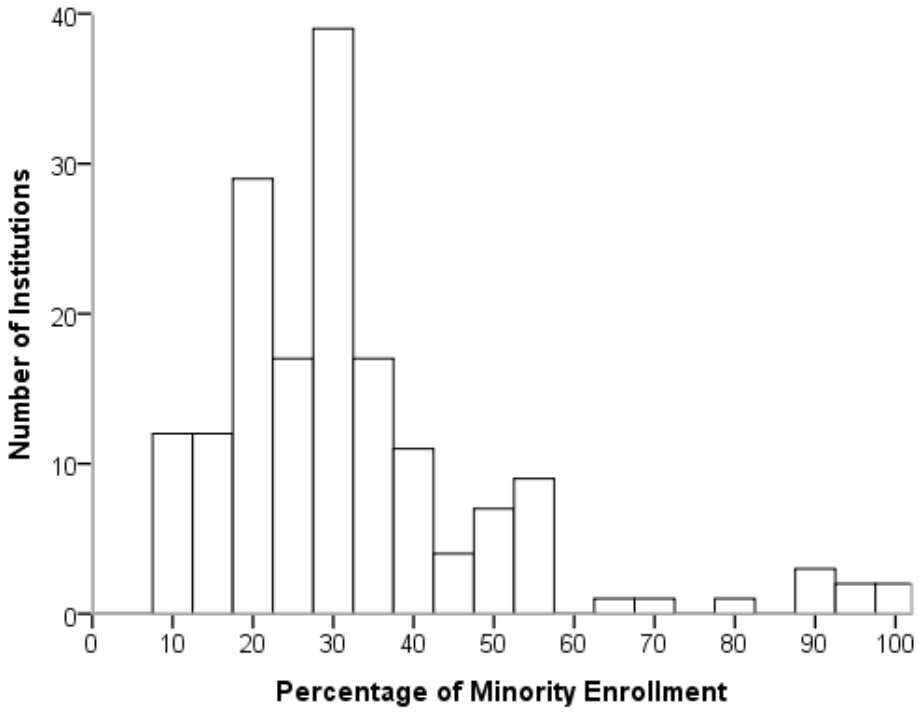

Figure 3. Percentage of minority enrollment at U.S. medical and dental institutions during the 2014-2015 academic year.

The percentage of female enrollment at institutions offering medical and dental programs was calculated by dividing the total number of female students enrolled at the institution by the total number of enrolled students. There were no instances where gender was not reported by the institution. The range extends from 38% to 73% (N=168, M=54.99, SD=6.66). The frequency distribution for these percentages is shown in Figure 4.

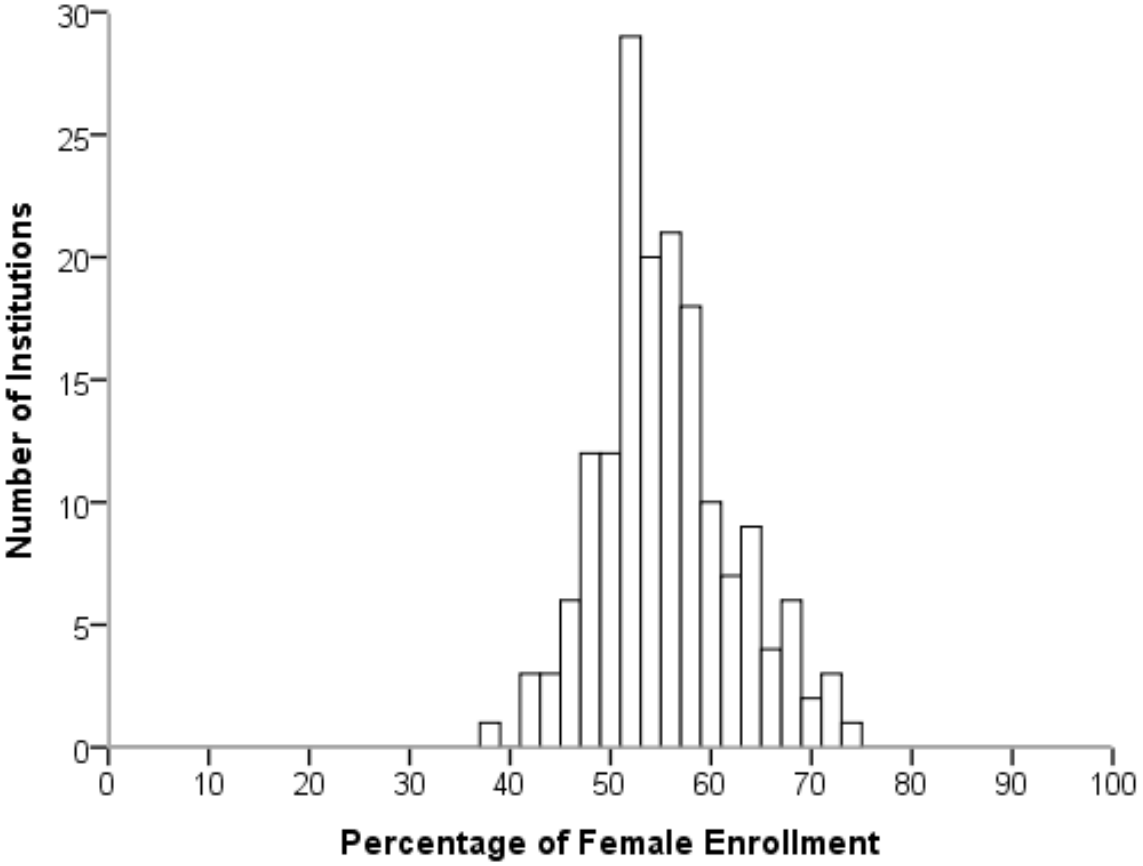

Figure 4. Percentage of female enrollment at U.S. medical and dental institutions during the 2014-2015 academic year.

Data Analysis

The data for each research question was analyzed using Ordinary Least Squares (OLS) regression. Only institutions that reported complete data were in included in the analysis for each specific research question. Institutions that reported incomplete data, or no data, were excluded from the analysis involving that data component which was not reported.

Research Question One

What is the distribution of medical degrees conferred by gender based upon these characteristics?

- *Control of institution*
- *BEA region*
- *Degree of urbanization*
- *basic Carnegie classification*
- *Institution has a hospital*
- *Institution size category*

To determine if these institutional characteristics could explain differences the proportion of degrees awarded by gender in medical programs, research question one was analyzed using descriptive statistics. The variables used were control of institution, BEA region, degree of urbanization, 2010 basic Carnegie classification, institution has a hospital, and institution size category. All medical schools reporting completers are used in this analysis. The distribution of female medical degree completers and variables are described in Table 10. The percentage of female degree completers was measured on a continuous scale and the entire population was used in the analysis.

Table 10

Distribution of Female Medical Degree Completers by Control of Institution , BEA Region, Degree of Urbanization, 2010 basic Carnegie classification, Institution has a Hospital, and Institution Size Category

Value	N	M	SD	Min.	Max.
CONTROL					
Public	84	46.71	5.28	33.11	61.79
Private not-for-profit	70	48.64	6.41	32.43	70.97
OBEREG					
New England	10	50.78	5.45	43.21	61.79
Mid East	31	48.68	4.02	41.46	57.14
Great Lakes	22	48.05	3.67	39.79	53.62
Plains	15	47.00	5.73	37.61	57.98
Southeast	41	45.82	7.70	33.11	70.97
Southwest	13	47.58	6.66	32.43	58.56
Rocky Mountains	3	43.90	5.88	37.50	49.06
Far West	16	47.34	5.11	36.11	54.24
Outlying Areas	4	51.90	3.88	48.89	57.14
LOCALE					
City: Large	61	48.85	5.66	37.61	70.97
City: Midsize	32	46.73	6.03	33.11	61.90
City: Small	22	45.74	5.90	33.33	57.14
Suburb: Large	28	47.53	5.68	32.43	53.49
Suburb: Midsize	2	45.93	13.89	36.11	55.75
Suburb: Small	1	52.83		52.83	52.83
Town: Fringe	1	48.86		48.86	48.86
Town: Distant	4	48.33	5.44	44.00	56.25
Town: Remote	4	43.58	4.69	37.31	47.73
CCBASIC					
Associate's – Private not-for-profit, 4-year, primarily Associate's	3	46.05	8.84	36.11	53.03
Research Universities (very high research activity)	62	48.51	4.57	37.50	61.90
Research Universities (high research activity)	23	46.67	5.50	34.03	57.98
Doctoral/Research Universities	4	45.66	5.26	39.19	51.85
Master's Colleges and Universities (larger programs)	9	48.08	8.27	33.33	56.25
Baccalaureate Colleges – Arts & Sciences	1	37.31		37.31	37.31
Medical Schools and medical centers	48	47.57	6.96	32.43	70.97
Not applicable, not in Carnegie Universe (not accredited or non-degree granting)	5	43.58	2.26	40.31	46.03

Value	N	M	SD	Min.	Max.
HOSPITAL					
Yes	66	47.78	5.87	32.43	61.90
No	87	47.37	5.92	33.33	70.97
Not Applicable	2	49.32	5.90	45.14	53.49
INSTSIZE					
Under 1,000	16	49.91	8.31	36.11	70.97
1,000-4,999	41	45.72	6.17	32.43	61.79
5,000-9,999	10	50.39	4.40	43.93	55.75
10,000-19,999	31	48.86	5.89	33.33	61.90
20,000 and above	57	47.04	4.53	34.03	57.84

For the variable of CONTROL, whether the institution is public, private not-for-profit, or private for-profit, private not-for-profit institutions had the greatest percentage of female medical degree completers at 48.64%. This value also had the largest range, 32.43% to 70.97%. Only one institution was categorized as a private for-profit and they had the lowest percentage of female medical degree completers, 45.14%.

For the variable of OBEREG, one of eight BEA regions defined by geography and demography which included New England, Mid East, Great Lakes, Plains, Southeast, Southwest, Rocky Mountains, Far West, and Outlying Areas, were examined. Institutions located in the Outlying Areas, which included American Samoa, Federated States of Micronesia, Guam, Marshall Islands, Northern Mariana Islands, Puerto Rico, Palau, and Virgin Islands, had the highest percentage of female medical degree completers, 51.90%, while institutions in the Rocky Mountain region, which included Colorado, Idaho, Montana, Utah, and Wyoming, had the lowest percentage of female medical degree completers, 43.90%. These were also the two geographic regions with the smallest amount of institutions located in them, with four and three institutions. Institutions in the Southeast have the greatest range from 33.11% to 70.97%.

For the variable of LOCALE, the degree of urbanization of an institution, the institutions were divided into nine categories based on the location of the institution. Those categories

included City: Large, City: Midsize, City: Small, Suburb: Large, Suburb: Midsize, Suburb: Small, Town: Fringe, Town: Distant, and Town: Remote. Institutions in the Suburb: Small category showed the largest percentage of female medical degree completers, 52.83%, while those in Town: Remote showed the smallest, 43.58%. City: Large showed the largest range with 37.61% to 70.97%.

CCBASIC, basic Carnegie classification, is a classification designation awarded to all accredited institutions by The Carnegie Foundation based on factors such as research activity level and program size. When institutions make changes or additions to their programs, their classification may not be immediately updated to match current program offerings. Therefore, the basic Carnegie classification for some institutions in this study may not match their expected classification based on current degrees awarded. The 2010 basic Carnegie classifications that were used for this study and the values examined were Associate's – private not-for-profit, Research Universities (very high research activity), Research Universities (high research activity), Doctoral/Research Universities, Master's College and Universities (larger programs), Baccalaureate Colleges – Arts & Sciences, Medical Schools and medical centers, and Not Applicable, not in the Carnegie Universe (not accredited or non-degree granting). Institutions identified as Research Universities (very high research activity) showed the largest percentage of female degree completers, 48.51%, and Baccalaureate Colleges – Arts & Sciences the smallest percentage, 37.31%. The greatest range was Medical schools and medical centers with 32.43% to 70.97%.

For the variable HOSPITAL, whether or not the institution has a hospital, the recorded values were yes, no, or not applicable. Institutions that reported not applicable produced the largest number of female medical degree completers, 49.32%, with institutions that reported no

having the smallest percentage, 47.37%. The range between the institutions with the highest and the lowest percentage of female medical degree completers was very narrow. Institutions reporting no hospital also had the largest range, 33.33% to 70.97%.

SIZE, the variable referencing institution size category size, used the values under 1,000, 1,000-4,999, 5,000-9,999, 10,000-19,999, and 20,000 and above. Institutions with a student enrollment of 5,000-9,999 reported the largest number of female medical degree completers, 50.39%, while those with 1,000-4,999 students reported 45.72%, the smallest percentage. While close in institution size category, there was a notable difference in percentage of degree production is these two categories. Institutions with enrollment under 1000 students had the largest range with 36.11% to 70.97%.

Research Question Two

What is the distribution of dental degrees conferred by gender based upon these characteristics?

- *Control of institution*
- *BEA region*
- *Degree of Urbanization*
- *basic Carnegie classification*
- *Institution has a hospital*
- *Institution size category*

To determine if these institutional characteristics could explain differences in the proportion of degrees awarded by gender to the proportion of degrees awarded to in dental programs, research question one was analyzed using descriptive statistics. The variables used were control of institution, BEA region, degree of urbanization, 2010 basic Carnegie

classification, institution has a hospital, and institution size category. All dental schools reporting completers were used in this analysis. The distribution of female dental degree completers and variable is described in Table 11. The percentage of female degree completers was measured on a continuous scale and the entire population was used in the analysis.

Table 11

Distribution of Female Dental Degree Completers by Control of Institution , BEA Region, Degree of Urbanization, 2010 basic Carnegie classification, Institution has a Hospital, and Institution Size Category

Variable	N	M	SD	Min.	Max.
CONTROL					
Public	39	51.24	8.74	35.29	69.81
Private not-for-profit	22	55.18	9.79	40.00	79.37
OBEREG					
New England	4	46.86	3.54	42.22	49.87
Mid East	10	48.41	7.45	40.00	62.20
Great Lakes	9	57.95	7.80	46.67	69.07
Plains	7	56.63	4.68	49.53	64.37
Southeast	14	49.61	10.40	35.42	69.81
Southwest	5	52.66	10.27	40.00	66.67
Rocky Mountains	1	50.00		50.00	50.00
Far West	10	57.90	9.16	46.58	79.37
Outlying Areas	1	35.29		35.29	35.29
LOCALE					
City: Large	34	53.86	9.67	35.29	79.37
City: Midsize	8	52.61	9.51	43.27	69.81
City: Small	6	46.56	7.50	35.42	55.81
Suburb: Large	11	53.08	7.88	42.22	63.71
Town: Remote	2	48.11	13.95	35.29	79.37
CCBASIC					
Research Universities (very high research activity)	27	51.12	8.23	40.00	69.81
Research Universities (high research activity)	10	49.91	9.30	35.42	64.47
Doctoral/Research Universities	3	54.13	7.61	46.58	61.80
Master's Colleges and Universities (larger programs)	3	63.74	5.67	57.78	69.07
Medical Schools and medical centers	16	52.93	8.83	35.29	66.67
Other health professions school	1	79.37		79.37	79.37
Not applicable, not in Carnegie Universe (not accredited or non-degree granting)	1	52.27		52.27	52.27
HOSPITAL					
Yes	35	51.53	8.67	35.29	69.81
No	26	54.15	9.95	35.42	79.37
INSTSIZE					
Under 1,000	1	51.85		51.85	51.85
1,000-4,999	16	55.86	11.49	35.29	79.37
5,000-9,999	4	53.21	7.80	46.58	64.37
10,000-19,999	8	57.40	7.58	46.91	69.81
20,000 and above	32	49.81	9.25	35.29	79.37

For the variable of CONTROL, whether the institution is public, private not-for-profit, or private for-profit, private not-for-profit institutions had the greatest percentage of female dental degree completers at 55.18%. They also had the largest range with 40% to 79.37%. Thirty-nine institutions were under public control and they reported the lowest percentage of female medical degree completers, 51.24%.

For the variable of OBEREG, one of eight BEA regions defined by geography and demography which include New England, Mid East, Great Lakes, Plains, Southeast, Southwest, Rocky Mountains, Far West, and Outlying Areas, were examined. Institutions located in the Great Lakes, which included Illinois, Indiana, Michigan, Ohio, and Wisconsin, had the highest percentage of female dental degree completers, 57.95%, while institutions in the Outlying Areas, which included American Samoa, Federated States of Micronesia, Guam, Marshall Islands, Northern Mariana Islands, Puerto Rico, Palau, and Virgin Islands, had the lowest percentage of female dental degree completers, 35.29%. The Outlying Areas had the smallest number of institutions in this data set with only one institution reporting. Institutions in the Far West had the greatest range, 46.58% to 79.37%.

For the variable of LOCALE, the degree of urbanization an institution has, the institutions were divided into nine categories based on the location of their institution. Those categories included City: Large, City: Midsize, City: Small, Suburb: Large, and Town: Remote. Institutions in the City: Large category showed the largest percentage of female dental degree completers, 53.86%, while those in City: Small showed the smallest, 46.56%. Town: Remote showed the largest range with 35.29% to 79.37%.

CCBASIC, basic Carnegie classification, is a classification designation awarded to all accredited institutions by The Carnegie Foundation based on factors such as research activity

level and program size. When institutions make changes or additions to their programs, their classification may not be immediately updated to match their current program offerings. The 2010 basic Carnegie classifications that were used for this study and the values examined were Research Universities (very high research activity), Research Universities (high research activity), Doctoral/Research Universities, Master's College and Universities (larger programs), Medical Schools and medical centers, Other health professions school, and Not Applicable, not in the Carnegie Universe (not accredited or non-degree granting). Institutions identified as Other health professions school showed the largest percentage of female degree completers, 79.37%art, and Research Universities (high research activity) showed the smallest percentage, 49.91%. The greatest range was Medical schools and medical centers with 35.29% to 66.67%.

For the variable HOSPITAL, whether or not the institution has a hospital, the recorded values were yes or no. Institutions that reported no produced the largest number of female dental degree completers, 54.15%, with institutions that reported yes had the smallest percentage, 51.53%. Institutions that reported no hospital also had the largest range, 35.42% to 79.37%.

SIZE, the variable referencing institution size category, used the values under 1,000, 1,000-4,999, 5,000-9,999, 10,000-19,999, and 20,000 and above. Institutions with a reported student enrollment of 10,000-19,999 reported the largest number of female dental degree completers, 57.40%, while those with 20,000 students or more reported 49.81%, the smallest percentage. Institutions with enrollment of 20,000 students or more also had the largest range with 35.29% to 79.37%.

Research Question Three

What combination of institutional characteristics best explain differences in the percentage of medical degrees conferred to females?

In linear regression analysis, there is one dependent variable and several independent variables. For this study, the percentage of medical degrees conferred to females was the dependent variable and the various institutional characteristics were the independent variables. A model summary showed that 27.2% of the variance in the percentage of medical degrees conferred to females can be explained by this combination of these institutional characteristics. This regression also demonstrated that institutional characteristics do have a significant effect, $F(20,134) = 2.50$, $p=.00$, on medical degree completion by females as shown in Table 12.

Table 12

Summary Table for ANOVA of Percentage of Female Medical Degree Completers in Model

		SS	df	MS	F	Sig.
Model	Regression	1440.61	20	72.03	2.50	0.01*
	Residual	3858.54	134	28.80		
	Total	5299.15	154			

*p<.05

For the multiple regression analysis shown in Table 13, similar cell sizes within each institutional characteristic were created through the use of recoding the independent variables when appropriate. For the variables of CONTROL, OBEREG, PERCENTMINORITY, and PERCENTFEMALE, no grouping of data was done. For LOCALE, institutions were grouped into City: Large (RLOCALECL), City: Medium (RLOCALECM), City: Small (RLOCALECS), Suburb: Large (RLOCALESL), and all others (RLOCALEOTHER). For CCBASIC, institutions were grouped into Research University Very High (CCBASICRUVH), Research University High (CCBASICRUH), Medical Schools and Medical Centers and Other Health Professions Schools (CCBASICPRO), and all others (CCBASICOTH). For HOSPITAL, institutions were categorized as yes and no, with not applicable was grouped with those answering no. RINSTSIZE, institution size category, was recoded from the ordinal values into a value representative of the midpoint of the size band. The excluded variables were ROBEREGSE,

RLOCALECL, and CCBASICRUVH. Significant differences were found in the BEA regions of Northeast, p=.02, and Great Lakes, p=.04. For basic Carnegie Classification significant was found in Medical Schools and Medical Centers and Other Health Professional Schools, p=.01, and those classified as all others, p=.03. Institutional size category was significant, p=.03, as was percent of minority enrollment, p=.000.

Table 13

Multiple Regression for Institutional Characteristics in Medical Schools

Characteristic	B	β	*t*	Sig
(CONSTANT)	45.20		9.43	0.00*
RCONTROL	0.17	0.02	0.15	0.88
ROBEREGNE	4.86	0.20	2.42	0.02*
ROBEREGME	2.55	0.18	1.79	0.08
ROBEREGGL	3.21	0.19	2.06	0.04*
ROBEREGPL	2.71	0.14	1.56	0.12
ROBEREGSW	0.42	0.20	0.22	0.83
ROBEREGRM	0.56	0.01	0.17	0.87
ROBEREGFW	-1.61	-0.08	-0.92	0.36
ROBEREGOA	-4.26	-0.12	-1.18	0.24
RLOCALECM	-1.51	-0.11	-1.15	0.25
RLOCALECS	-1.43	-0.09	-0.93	0.35
RLOCALESL	-1.41	-0.09	-1.08	0.28
RLOCALEOTHER	0.18	0.01	0.10	0.92
CCBASICRUH	-2.65	-0.17	-1.84	0.07
CCBASICPRO	-5.42	-0.43	-2.71	0.01*
CCBASICOTH	-4.70	-0.26	-2.23	0.03*
RHOSPITAL	0.20	0.02	0.20	0.84
RINSTSIZE	0.00	-0.33	-2.19	0.03*
PERCENTMINORITY	0.17	0.52	4.67	0.00*
PERCENTFEMALE	0.20	0.02	0.24	0.81

*p<.05

Research Question Four

What combination of institutional characteristics best explain differences in the percentage of dental degrees conferred to females?

For this study, the percentage of dental degrees conferred to females was the dependent variable and the various institutional characteristics were the independent variables. The model

summary showed that although 40.6% of the variance in the percentage of dental degrees conferred to females may be explained by this combination of institutional characteristics, this is not a significant effect, F(20,40) = 1.37, p=.20, on dental degree completion by females as shown in Table 14.

Table 14

Summary Table for ANOVA of Percentage of Female Dental Degree Completers in Model

		SS	df	MS	F	Sig.
Model	Regression	2083.86	20	104.19	1.37	0.20
	Residual	3046.19	40	76.16		
	Total	5130.04	60			

For the multiple regression analysis shown in Table 15, similar cell sizes within each institutional characteristic were created through the use of recoding the independent variables when appropriate. As shown in Table 16, for the variables of CONTROL, OBEREG, PERCENTMINORITY, and PERCENTFEMALE, no grouping of data was done. For LOCALE, institutions were grouped into City: Medium (RLOCALECM), City: Small (RLOCALECS), Suburb: Large (RLOCALESL), and all others (RLOCALEOTHER). For CCBASIC, institutions were grouped into Research University Very High (CCBASICRUVH), Research University High (CCBASICRUH), Medical Schools and Medical Centers and Other Health Professions Schools (CCBASICPRO), and all others (CCBASICOTH). For HOSPITAL, institutions were categorized as yes and no, with not applicable was grouped with those answering no. Institutional size category, RINSTSIZE, was recoded from the ordinal values into a value representative of the midpoint of the size band. The excluded variables were ROBEREGSE, RLOCALECL, and CCBASICRUVH. This analysis indicates that there are no significant effects from these institutional characteristics on dental degree production among females.

Table 15

Multiple Regression for Institutional Characteristics in Dental Schools

Characteristic	B	β	*t*	Sig
(CONSTANT)	73.19		4.08	0.00*
RCONTROL	-1.69	-0.09	-0.52	0.61
ROBEREGNE	-6.88	-0.19	-1.19	0.24
ROBEREGME	-1.56	-0.06	-0.37	0.72
ROBEREGGL	3.52	0.14	0.78	0.44
ROBEREGPL	3.53	0.12	0.72	0.46
ROBEREGSW	0.56	0.02	0.10	0.92
ROBEREGRM	2.79	0.04	0.28	0.78
ROBEREGFW	6.06	0.25	1.37	0.18
ROBEREGOA	-9.97	-0.14	-0.89	0.38
RLOCALECM	0.41	0.02	0.10	0.92
RLOCALECS	-4.23	-0.14	-0.92	0.36
RLOCALESL	-0.56	-0.02	-0.17	0.87
RLOCALEOTHER	-6.30	-0.12	-0.89	0.38
CCBASICRUH	-2.07	-0.09	-0.54	0.59
CCBASICPRO	-1.87	-0.09	-0.28	0.78
CCBASICOTH	1.68	0.05	0.25	0.80
RHOSPITAL	-1.60	-0.09	-0.60	0.55
RINSTSIZE	0.00	-0.33	-1.06	0.30
PERCENTMINORITY	-0.09	-0.17	-0.93	0.36
PERCENTFEMALE	-0.19	-0.13	-0.66	0.51

Research Question Five

What differences, if any, exist between the characteristics affecting medical degree production and those affecting dental degree production?

This research question examines the relationships between the findings in research questions one and two, and research questions three and four. Differences were found between the institutional characteristics that affect degree production by gender in institutions awarding medical degrees and those awarding dental degrees. At institutions awarding medical degrees, significantly greater percentages of degrees were awarded to females at institutions in the BEA region of New England (50.78%), and institutions with smaller overall enrollment and larger minority enrollment. Significantly fewer percentages of degrees were awarded to females ad

institutions in the BEA region Great Lakes(48.05%), 2010 basic Carnegie classifications of Research Institutions (High Research Activity) (46.67%) and Other Institutions (43.58%), and at institutions with larger enrollment and smaller minority enrollments. At institutions awarding dental degrees, no significant differences were found for any of these institutional characteristics.

Summary

This chapter presented the results of the data analyses that were conducted to answer the research questions in this study on institutional characteristics such as control of institution, BEA region, degree of urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category, percentage of minority enrollment, and percentage of female enrollment. Descriptive statistics were provided to present a profile of the student population and the institutions. Inferential statistics, through the use of multiple regression analysis, were utilized to determine if control of institution, BEA region, degree of urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category, percentage of minority enrollment, and percentage of female enrollment could explain differences it the percentage of female degree completers in medical and dental programs. Using the data presented here, Chapter V will discuss the findings, describe conclusions, address policy and practice implications, and provide recommendations for future research.

CHAPTER V:

CONCLUSIONS

The purpose of this study was to determine if institutional characteristics, such as control of institution, BEA regions, degree of urbanization, 2010 basic Carnegie classification, institution has a hospital, institution size category, percentage of minority enrollment, and percentage of female enrollment, could be used to explain differences in the proportion of degrees awarded to women. The conceptual framework for this study focused on female degree production in medical and dental programs and how institutional characteristics could be used to explain the differences in degree production across institutions. This study was not intended to determine the underlying causes of gender bias, but rather to identify institutional characteristics that explain these differences as they exist.

This chapter will summarize and interpret the findings described in Chapter IV. The chapter starts with a question-by-question interpretation of the findings for each of the five research questions followed by summaries of these findings. Finally, the chapter will conclude with a discussion on possible future research efforts, as well as policy and practice related initiatives.

Research Findings

Research Question One

What is the distribution of medical degrees conferred by sex based upon these characteristics?

- *Control of institution*
- *BEA region*
- *Degree of Urbanization*
- *basic Carnegie classification*
- *Institution has a hospital*
- *Institution size category*

Descriptive statistics were used to examine the relationship between these institutional characteristics and female degree completion in medical schools. The data showed that for the control of institution, private not-for-profit institutions had the largest percentage of female completers, 48.64%. For the variable BEA region, institutions in the Outlying Areas had the largest percentage of female completers, 51.90%. For the variable degree of urbanization, those in Suburb: Small showed the largest percentage of female completers, 52.83%. In terms of basic Carnegie Classification, institutions classified as Research University (very high research activity) showed the largest percentage of female medical completers with 48.51%. The variable institution has a hospital showed the narrowest range and those institutions that answered ‘not applicable’ produced the largest percentage of female completers, 49.32%. Finally, institution size category showed that institutions in the 5,000-9,999 enrollment band produced the largest percentage of female completers, 50.39%, while the 1,000-4,999 enrollment band produced the smallest percentage at 45.72%.

Research Question Two

What is the distribution of medical degrees conferred by sex based upon these characteristics?

- *Control of institution*
- *BEA region*
- *Degree of urbanization*
- *basic Carnegie classification*
- *Institution has a hospital*
- *Institution size category*

Descriptive statistics were used to examine the relationship between these institutional characteristics and female degree completion in dental schools. The data showed that for the variable control of institution, private not-for-profit institutions had the largest percentage of female completers, 55.18%. For the variable BEA region, institutions in the Great Lakes had the largest percentage of female completers, 57.95%. In terms of degree of urbanization, those in City: Large showed the largest percentage of female completers, 53.86%. For the variable basic Carnegie classification, institutions classified as Other health professions schools showed the largest percentage of female medical completers with 49.91%. The variable of whether or not an institution has a hospital showed the narrowest range, but those institutions that no produced the largest percentage of female completers, 54.15%. Finally, institution size category showed that institutions in the 10,000-19,999 enrollment band produced the largest percentage of female completers, 57.40%, while those with 20,000 or more enrolled produced the smallest percentage at 49.81%.

Research Question Three

What combination of institutional characteristics best explain differences in the percentage of medical degrees conferred to females?

An ANOVA revealed that institutional characteristics do play a significant role in medical degree completion by females, $F(20,134)=2.50$, $p=.001$. Further multiple regression analysis showed that for BEA region, Northeast, $p=.02$, and Great Lakes, $p=.04$, were significant. In terms of basic Carnegie Classification, the recoded data group that combined Medical Schools and Medical Centers along with Other health professional schools, $p=.01$, and the recoded data group labeled as All Others, $p=.03$ were significant. Institutional size category, $p=.03$, as well as percentage of minority enrollment, $p=.00$, were also found to have significant impact.

Research Question Four

What combination of institutional characteristics best explain differences in the percentage of dental degrees conferred to females?

No differences were found in the percentages of dental degrees conferred to females based upon institutional characteristics. An ANOVA revealed that institutional characteristics do not play a significant role in dental degree completion by females, $F(20,40)=1.37$, $p=.20$. Further multiple regression analysis confirmed that there was no significance for these institutional characteristics.

Research Question Five

What differences, if any, exist between the characteristics affecting medical degree production and those affecting dental degree production?

There is a difference in the significance of the institutional characteristics on medical and dental degree production. The data showed that for medical programs there was a significant

effect from the institutions BEA regions, basic Carnegie classification, institution size category, and percentage of minority enrollment. The data showed that for dental programs there was no significant effect from the characteristics studied.

Research Conclusions

Based on the data analysis and findings, the following conclusions can be made from this analysis.

Research Conclusion One

While not all institutional characteristics studied were significant in their relation to the percentage of degrees awarded to females in medical programs, the characteristics BEA region, basic Carnegie classification, institution size category, and percentage of minority enrollment are significantly associated with the percentage of females that were awarded medical degrees in the 2014-2015 academic year.

When examining these four institutional characteristics in more detail, varying degrees of significance amongst the variables become apparent. The BEA region Great Lakes had a significance of p=.04. Both institution size category and the recoded basic Carnegie classification group that included All Other institutions had a significance of p=.03. The BEA region Northeast had a significance of p=.02. The recoded basic Carnegie classification group that included Medical Schools and Medical Centers and Other health professions school had a significance of p=.01. Percentage of minority enrollment had a significance of p=.000. All other institutional characteristics studied were found to have no statistical significance on the percentage of female completers in medical degree programs in the 2014-2015 academic year. There were wide ranges in the percentages of dental degrees awarded to women. The largest percentage was Morehouse School of Medicine, 70.97%, and the smallest was Midwestern University - Glendale, 32.43%.

McLaughlin, McLaughlin, McLaughlin and White (2016) examined IPEDS data from the 2011-2012 academic year to study a select set of institutional characteristics in an attempt to determine if these institutional characteristics were influencing diversity in health professions education. This study examined professional doctoral degrees in not only medicine and dentistry, but also but combined the data with that of chiropractic, optometry, pharmacy, podiatry, and other programs to create a large and diverse data set. They then chose to study race, gender, level of urbanization, geographic region, and basic Carnegie classification. Within these institutional characteristics, the authors regrouped their geographic regions in a slightly more compressed set of groupings than those that the researcher used for this study, and fewer groupings were also used for all other characteristics; only three levels of urbanization, urban, suburban, and rural, and two levels of Carnegie classification, special focus and all others. The authors in that study found that institutions located in town/rural areas were less likely to be diverse, while special focus institutions were more likely to be racially and gender diverse than those under other Carnegie classifications. They also found that geographic region played a role in the level of diversity that an institution displayed (McLaughlin et al, 2016). This research indicates that these institutional characteristics can be used to explain differences on the percentage of females that obtain degrees in medicine and dentistry.

Research Conclusion Two

No institutional characteristics studied were significant in their effect on degree production in professional dental programs across genders in the 2014-2015 academic year.

None of the institutional characteristics studied showed a significant effect on dental degree production among women. Even though there were no significant differences, there were wide ranges in the percentages of dental degrees awarded to women between institutions. The

largest percentage of degrees awarded to women was as Roseman University of Health Sciences, 79.3%, and the smallest was University of Puerto Rico – Medical Sciences, 35.29%, a range of 44.01%. These data are inconsistent with a study in which Marsh (2014) analyzed IPEDS data from the 2007-2008 reporting year to examine whether or not institutional characteristics could be influencing factors in institutional retention rates. He found that institutional size was found to have a positive, statistically significant association with student retention rates. The study found that first-time student retention rates increased with the size of the institution. While the characteristic of institutional size was significant during the 2007-2008 academic year, the institutional environment may have changed in the seven years between studies that lead to the conclusion found in this study.

Research Conclusion Three

While some institutional characteristics examined in the study were statistically significant in regards to female medical degree production, no institutional characteristics examined in the study were statistically significant in regards to female dental degree production.

BEA regions, basic Carnegie classification, institution size category and percentage of minority enrollment had statistical significance for medical degree production but not dental degree production. For both medical and dental programs, control of institution, degree of urbanization, institution has a hospital, and percentage of female enrollment had no significant effect. While no institutional characteristics were found to be significant in both medical and dental programs, wide ranges between degree completion in medical and dental programs at institutions offering degrees in both fields were noted. The University of Kentucky reported 38.32% of their medical degrees and 67.31% of their dental degrees were awarded to women, a

range of 28.99% with the larger percentage of degrees awarded to women in dentistry. The University of Puerto Rico - Medical Sciences reported 48.89% of their medical degrees and 35.29% of their dental degrees were awarded to women, a range of 13.6 % with the larger percentage of degrees awarded to women in medicine. Other institutions are close to parity in the percentage of degrees awarded to women. Boston University, reported 50% of their medical degrees and 49.78% of their dental degrees awarded to women. Even though the overall percentage of degrees awarded to women in these fields is near parity, wide ranges exist both between and within institutions in the proportion of degrees awarded even though none of the institutional characteristics in this study were found to be significant across fields.

Recommendations for Policy and Practice

This study analyzed the relationship between degree production by gender and characteristics of the institutions that award these degrees. Based upon the findings of this study, the researcher suggests the following recommendations for both policy and practice related to gender in professional programs in the health sciences.

Modification of Institutional Recruitment, Admissions, and Acceptance Practices

By examining institutional characteristics that may affect gender equity, individual institutions may be able to pinpoint institutional characteristics that are contributing to inequity in their degree production. Institutions may start with an internal evaluation of their own institutional-level data to first identify their percentages of female degree production. When comparing their own institutional-level data to national data, institutions may be able to identify if they differ from their peers in female degree production based on each institutional characteristic category. Due to the exceptionally high completion rate in these programs, completion rates are controlled by recruitment, admissions and matriculation practices. If an

institution determines that their female degree production is lower than average and wants to increase their percentage, they would actively work to recruit, admit, and matriculate qualified females. If an institution determines that their female degree production is higher than average and wants to increase their number of male completers, they would actively work to recruit, admit, and matriculate higher numbers of qualified males. By modifying their recruitment, admissions, and acceptance policies and actively seeking to find qualified candidates of all genders, institutions can move toward gender equity. If an institution finds parity, they can continue with existing policies and practices to maintain equity, or they may choose to change behaviors to meet institutional goals. While institutions may be unable to control many of these characteristics, they still have the ability to control their enrollment pipeline.

Institutional Choice

Choosing which medical or dental school to attend is one of the most important decisions that a future physician or dentist may face. Students may use the data in this study to make an informed decision on the type of institution at they may excel at. For example, a female student who wished to attend medical school may want to choose an institution in the Great Lakes or Northeast regions, with a basic Carnegie classification of Medical schools and medical centers or Other health professions schools, with a modest institutional size, and a high percentage of minority enrollment given the high proportion of female medical degrees awarded at institutions that fall into these categories. Examining potential choices based on this research project could lead students to attend institutions where they will excel in greater numbers. A female student considering a career in dentistry would not be able to use this research to make decisions on where to attend school as the research did not find any connection between the institutional characteristics studied and female degrees awarded.

Recommendations for Future Research

Considering the finding of this research study, the researcher suggests the following recommendations for future research related to institutional characteristics that affect degree production.

Race and Ethnicity

This research study was conducted examining the effects of institutional characteristics on the percentage of female degree completers in medical and dental programs. Race and ethnicity were not variables that were explored in depth in this study, but future research could add those variables in as an additional dependent variable to examine the impact of these institutional characteristics on gender and race and ethnicity. Possible future research would also include repeating this study with a substitution of the dependent variable of gender for race and ethnicity. The study could be formatted in a manner identical to this medical and dental study, with all data required being readily available in the IPEDS data sets. By using large national data sets, consistency in data acquisition and within the elements of the data reporting can be maintained. This research would provide a more comprehensive overview of medical and dental education.

Study of Other First-Professional Programs

The scope of this research project was limited to medical and dental programs due to the similarity in program requirements, however this research could easily be expanded to include other first-professional programs such as chiropractic medicine, podiatry, ophthalmology, pharmacy, law, theology, and veterinary medicine. A study such as this would provide more complete data to examine the influence of institutional characteristics on female degree completion across all first-professional programs, providing institutions that offer programs in

fields of study other than medicine and dentistry greater insight into how their own institutional characteristics may be affecting degree completion. The comprehensive study could be formatted in a manner identical to this medical and dental study, with all data required being readily available in the IPEDS data sets. The study could be duplicated structurally for any first-professional program by selecting data for the CIP codes for the program of interest. By using large national data sets, consistency in data acquisition and within the elements of the data reporting can be maintained. This research would provide a more comprehensive overview of first-professional graduate education.

Interprofessional Education

The barriers between the silos in which professional programs in the health sciences operate continues to crumble as institutions adopt practices that cross professions. Interprofessional education (IPE) and interprofessional collaborative practice (IPC) are playing an increasingly prominent role both in the future of education in the health professions and in healthcare delivery, domestically and abroad. The promotion and advancement of IPE is becoming a focus of the accreditation process. The health care fields of nursing and pharmacy have already made great inroads into incorporating IPE between their professions as education is headed toward large-scale transformations of the healthcare system along team-based lines (Zorek & Raehl, 2013).

Although the fields of medicine and dentistry operate in different spheres, an individual's dental and general health are intertwined. Dental schools emerged as institutions separate from medical schools in the U.S. in the mid-19th century and have undergone continuous transformations. The integration of oral health within the healthcare system improves patient experiences and outcomes while decreasing the overall cost of care (Mertz, 2016). As Formicola

et al. (2012) point out, dentistry is now seen as a critical component of the primary care system in the U.S. and management of chronic health conditions can both be affected by and have consequences for patients' oral health. By interacting with other health systems, dentistry can seek to improve overall access to healthcare and implement preventative care measures that might otherwise not affect a patient.

Munz, Kim, Holley, Donkersloot, and Inglehart (2017) found that medical students have lower levels of interprofessional skills and knowledge than their dental counterparts, but that there was no difference in their attitudes toward IPE. Hospitals provide distinct opportunities in these professions for both IPE and IPC through dental units and oral and maxillofacial surgery programs. Combined problem-based learning (PBL) groups at institutions that offer both medical and dental programs also provide participants with experiences where they can gain information from their peers and share in opportunities for interdisciplinary collaboration. Amin et al. (2017) found that dental students value PBL experiences and the opportunity to learn alongside medical students, but that attention must be paid to the content and preceptors' roles in order to optimize these experiences.

Future research could examine if the inclusion of IPE as a curriculum component as an additional institutional characteristic and the influence this may have on the proportion of degrees awarded to females. IPE provides the opportunity for positive practice patterns to be spread amongst all students, which may lead to practitioners with more positive patient outcomes and this research may help institutions decide whether or not implementation of a curriculum with an IPE component would be beneficial for their completion pipeline.

Institutional Case Studies

This research study found wide ranges in the proportion of degrees awarded to females in medical and dental programs in the U.S. both between and within institutions. Research projects designed as a case study could be conducted at institutions on the extreme ends of the ranges to determine what makes them different from other institutions studied. These institutions could use the data from these studies to determine if policy or practice changes are necessary to meet institutional goals.

Concluding Thoughts

This study sought to determine if there were institutional characteristics that influenced the proportion of degrees awarded by gender in professional programs in medicine and dentistry. The results of the study provide valuable analysis into the institutional characteristics that are influential in degree production for females in medical and dental programs.

Quantitative research methods provided the basis for this study, allowing the researched to analyze existing data sets in order to identify which institutional characteristics, if any, were statistically relevant to female degree completion in medical and dental programs. In this study, the researcher found that BEA regions, basic Carnegie classification, institution size category and percentage of minority enrollment were statistically significant characteristics for medical programs and that there were no statistically significant characteristics for dental programs. Previously, any research conducted that looked at institutional characteristics and their significance on the effect on degree production had been siloed by program. Medical programs were examined alone. Dental programs were studied alone. With this study, the researcher pulled two disciplines together that are closely related, not just by prerequisites and curriculum, but by the academic pathway that the student follows towards their degree. In doing so, the researcher

has laid the groundwork for future research opportunities examining how these institutional characteristics may or may not affect other first-professional programs.

Additional research with the addition a second dependent variable of race/ethnicity or the inclusion of the additional institutional characteristic of having IPE as a curricula component would continue to broaden this study and give it an even wider, overarching view of the educational climate. Additionally, case studies on institutions that fall at the extreme ends of ranges could give them valuable data that could help them to determine if institutional change is needed to meet goals. Coupled with the policy and practice recommendations of the possible modification of institutions' recruitment, admissions, and acceptance policies, institutions can use this study as a basis for self-examination and, from there, seek to gain further gender equity.

REFERENCES

Allan, E. J. (2011). *Women's status in higher education: Equity matters*. San Francisco, CA: Jossey-Bass.

American Association of Colleges of Osteopathic Medicine. (2017). Applying to osteopathic medical college Retrieved from http://www.aacom.org/become-a-doctor/applying

American Dental Association. (2016). *2015-2016 survey of dental education.* Washington, DC: American Dental Association.

American Dental Association. (2017). General dentistry and interest areas Retrieved from http://www.ada.org/en/education-careers/careers-in-dentistry/general-dentistry

American Dental Education Association. (2017). ADEA AADSAS applicant login page. Retrieved from https://aadsas.liaisoncas.com/

American Medical Association. (2017). Definition of a physician H-405.969. Retrieved from https://searchpf.ama-assn.org/SearchML/searchDetails.action?uri=%2FAMADoc%2FHOD.xml-0-3589.xml

Amin, M., Zulla, R., Gaudet-Amigo, G., Patterson, S., Murphy, N., & Ross, S. (2017). Dental students' perceptions of learning value in PBL groups with medical and dental students together versus dental students alone. *Journal of Dental Education, 81*(1), 65-74. doi:81/1/65 [pii]

Anderson, E. L., Duranleau, L., Garrison, G. E., & Valachovic, R. W. (2015). U.S. dental school applicants and enrollees, 2013 entering class. *Journal of Dental Education, 79*(5), 592-605.

Anderson, M. B., & Kanter, S. L. (2010). Medical education in the United States and Canada, 2010. *Academic Medicine, 85*(9)

Association of American Medical Colleges. (2015). *Results of the 2014 medical school enrollment survey.* (No. 12-237). Washington, DC: Association of American Medical Colleges.

Association of American Medical Colleges. (2016a). *AAMC data book: Medical schools and teaching hospitals by the numbers, 2016*. Washington, DC: Association of American Medical Colleges.

Association of American Medical Colleges. (2016b). *The 2016 update: Complexities of physician supply and demand: Projections from 2014 to 2025*. Washington, DC: Association of American Medical Colleges.

Association of American Medical Colleges. (2017a). About the AAMC - AAMC. Retrieved from https://www.aamc.org/about/

Association of American Medical Colleges. (2017b). Liaison committee on medical education (LCME) - leadership. Retrieved from https://www.aamc.org/members/osr/committees/48814/reports_lcme.html

Association of American Medical Colleges. (2017c). Applying to medical school with AMCAS. Retrieved from https://students-residents.aamc.org/applying-medical-school/applying-medical-school-process/applying-medical-school-amcas/

Atre-Vaidya, N. (2006). Women chairs in psychiatry: A collective reflection *Academic Psychiatry: The Journal of the American Association of Directors of Psychiatric Residency Training and the Association for Academic Psychiatry, 30*(4), 315-318. doi30/4/315

Basco, W. T., J., Buchbinder, S. B., Duggan, A. K., & Wilson, M. H. (1999). Relationship between primary care practices in medical school admission and the matriculation of underrepresented-minority and female applicants. *Academic Medicine: Journal of the Association of American Medical Colleges, 74*(8), 920-924.

Bauer, B. A. (2017). Osteopathic medicine: What kind of doctor is a D.O.? Retrieved from http://www.mayoclinic.org/healthy-lifestyle/consumer-health/expert-answers/osteopathic-medicine/faq-20058168

Bayne-Jones, S., & Bane, F. (1959). *The advancement of medical research and education through the department of health, education, and welfare; final report of the secretary's consultants on medical research and education.* Washington, DC: U.S. Department of Health, Education, and Welfare.

Bell, N. (2010). *Graduate enrollment and degrees: 1999-2009*. Washington, DC: Council of Graduate Schools.

Bender, D. J. (2007). Patient preference for a racially or gender-concordant student dentist. *Journal of Dental Education, 71*(6), 726-745.

Bender, D. J., Burk, D. T., & Candito, K. P. (2007). Applicant-interviewer gender concordance and the decision to enroll in dental school. *Journal of Dental Education, 71*(3), 348-353.

Borges, N. J., Manuel, R. S., Elam, C. L., & Jones, B. J. (2010). Differences in motives between millennial and generation X medical students. *Medical Education, 44*(6), 570-576.

Boulis, A. K., & J. A. Jacobs. (2008). *The changing face of medicine: Women doctors and the evolution of health care in America (the culture and politics of health care work).* Ithaca, NY: ILR Press.

Carr, P. L., Ash, A. S., Friedman, R. H., Szalacha, L., Barnett, R. C., Palepu, A., & Moskowitz, M. M. (2000). Faculty perceptions of gender discrimination and sexual harassment in academic medicine *Annals of Internal Medicine, 132*(11), 889-896. doi:200006060-00007

Cassedy, J. H. (1991). *Medicine in America: A short history*. Baltimore, MD: Johns Hopkins University Press.

Caulfield, M., Redden, G., & Sondheimer, H. (2014). *Graduation rates and attrition factors for U.S. medical school students.* (No. 14:5). Washington, DC: Association of American Medical Colleges.

Chapman, C. B. (1974). The Flexner report by Abraham Flexner. *Daedalus, 103*, 105-117.

Chenot, J. (2009). Undergraduate medical education in Germany. *GMS German Medical Science, 7*, 1-11.

Cook, B. J. (April 14, 2017). In author (Ed.), *Personal communication*

David, M. E. (2015). Women and gender equality in higher education? *Educational Sciences, 5*(1), 10. doi:10.3390/educsci5010010

Dezee, K. J., Artino, A. R., Elnicki, D. M., Hemmer, P. A., & Durning, S. J. (2012). Medical education in the United States of America. *Medical Teacher, 34*(7), 521-525. doi:10.3109/0142159X.2012.668248

Filardo, G., da Graca, B., Sass, D. M., Pollock, B. D., Smith, E. B., & Martinez, M. A. (2016) *Trends and comparison of female first authorship in high impact medical journals: Observational study (1994-2014).* BMJ, 352

Fischbach, R. L., & Hunt, M. (1999). "Behind every problem lies an opportunity": Meeting the challenge of diversity in medical schools... part I. *Journal of Women's Health & Gender-Based Medicine, 8*(10), 1240-1247.

Flexner, A. (1910). *Medical Education in the United States and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching. Bulletin Number 4*. Boston, MA: Updyke.

Formicola, A. J., Andrieu, S. C., Buchanan, J. A., Childs, G. S., Gibbs, M., Inglehart, M. R., . . . Evans, L. (2012). Interprofessional education in U.S. and Canadian dental schools: An ADEA team study group report. *Journal of Dental Education, 76*(9), 1250-1268.

Garrison, G. E., McAllister, D. E., Anderson, E. L., & Valachovic, R. W. (2013). U.S. dental school applicants and enrollees, 2011 and 2012 entering classes. *Journal of Dental Education, 77*(12), 1677-1702.

Gies, W. J. (1926). *Dental education in the United States and Canada; a report to the Carnegie Foundation for the Advancement of Teaching*. New York, NY: Carnegie Foundation for the Advancement of Teaching.

Gill Foundation. (2017). Gender expression. Retrieved from https://gillfoundation.org/grants/gender-expression-toolkit/gender-expression/

Greysen, S. R., Chen, C., & Mullan, F. (2011). A history of medical student debt: Observations and implications for the future of medical education. *Academic Medicine: Journal of the Association of American Medical Colleges, 86*(7), 840-845. doi:10.1097/ACM.0b013e31821daf03

Haig, D. (2004). The inexorable rise of gender and the decline of sex: Social change in academic titles, 1945-2001. *Archives of Sexual Behavior, 33*(2), 87-96.

Haist, S., Wilson, J., Elam, C., Blue, A., & Wilson, J. (2000). The effect of gender and age on medical school performance: An important interaction. *Advances in Health Sciences Education, 5*(3), 197-205. doi:10.1023/A:1009829611335

Halperin, E. C., Perman, J. A., & Wilson, E. A. (2010). Abraham Flexner of Kentucky, his report, medical education in the United States and Canada, and the historical questions raised by the report. *Academic Medicine: Journal of the Association of American Medical Colleges, 85*(2), 203-210.

Hardy, D. E., & Katsinas, S. G. (2010). Changing STEM associate's degree production in public associate's colleges from 1985 to 2005: Exploring institutional type, gender, and field of study. *Journal of Women and Minorities in Science and Engineering, 16*(1), 7.

Hill, C., Corbett, C., St. Rose, A., & American Association of University, W. (2010). Why so few? Women in science, technology, engineering, and mathematics. *American Association of University Women.*

Hoffman, E., Magrane, D., & Donoghue, G. D. (2000). Foreword: Changing perspectives on sex and gender in medical education. *Academic Medicine: Journal of the Association of American Medical Colleges, 75*(11), 1051-55.

Hyson, J. M.,Jr. (2002). Women dentists: The origins. *Journal of the California Dental Association, 30*(6), 444-453.

Jagsi, R., Griffith, K. A., DeCastro, R. A., & Ubel, P. (2014). Sex, role models, and specialty choices among graduates of U.S. medical schools in 2006–2008. *Journal of the American College of Surgeons, 218*(3), 345-352. doi:10.1016/j.jamcollsurg.2013.11.012

Jolliff, L., Leadley, J., Coakley, E., & Sloane, R. A. (2012). *Women in U.S. academic medicine and science: Statistics and benchmarking report*. Washington, DC: Association of American Medical Colleges.

Kleinfeld, J. (2009a). The state of American boyhood. *Gender Issues, 26*(2), 113-129. doi:10.1007/s12147-009-9074-z

Kleinfeld, J. (2009b). No map to manhood: Male and female mindsets behind the college gender gap. *Gender Issues, 26*(3), 171-182. doi:10.1007/s12147-009-9083-y

Kondo, D. G., & Judd, V. E. (2000). Demographic characteristics of U.S. medical school admission committees. *JAMA: The Journal of the American Medical Association, 284*(9), 1111-1113.

Kozu, T. (2006). Medical education in Japan. *Academic Medicine, 81*(12)

Lalumandier, J. A., Pyle, M. A., & Sawyer, D. R. (1999). Public perception of DDS versus DMD degrees. *The Journal of the American College of Dentists, 66*(3), 29-37.

Leavitt, J. W. (1983). "Science" enters the birthing room: Obstetrics in America since the eighteenth century. *The Journal of American History, 70*(2), 281-304. doi:10.2307/1900205

Levine, R. B., Lin, F., Kern, D. E., Wright, S. M., & Carrese, J. (2011). Stories from early-career women physicians who have left academic medicine: A qualitative study at a single institution *Academic Medicine: Journal of the Association of American Medical Colleges, 86*(6), 752-758. doi:10.1097/ACM.0b013e318217e83b

Linn, E. L. (1971). Women dental students: Women in a man's world. *The Milbank Memorial Fund Quarterly, 49*(3), 63-76.

Lo Sasso, A. T., Richards, M. R., Chou, C. F., & Gerber, S. E. (2011). The $16,819 pay gap for newly trained physicians: The unexplained trend of men earning more than women. *Health Affairs (Project Hope), 30*(2), 193-201. doi:10.1377/hlthaff.2010.0597

Loevy, H. T., & Kowitz, A. A. (1999). Dental education for women dentists in the United States: The beginnings. *Quintessence International, 30*(8), 563-569.

Lott II, J. L., Gardner, S., & Powers, D. A. (2010). Doctoral student attrition in the STEM fields: An exploratory event history analysis. *Journal of College Student Retention: Research, Theory & Practice, 11*(2), 247-266.

Ludmerer, K. M. (1985). *Learning to Heal; The Development of American Medical Education*. New York: Basic Books.

Makam, A., Mallappa Saroja, C. S., & Edwards, G. (2010). Do women seeking care from obstetrician-gynaecologists prefer to see a female or a male doctor? *Archives of Gynecology and Obstetrics, 281*(3), 443-447. doi:10.1007/s00404-009-1199-5

Marchant, A., Bhattacharya, A., & Carnes, M. (2007). Can the language of tenure criteria influence women's academic advancement? *Journal of Women's Health, 16*(7), 998-1003. doi:10.1089/jwh.2007.0348

Mark, S., Link, H., Morahan, P. S., Pololi, L., Reznik, V., & Tropez-Sims, S. (2001). Innovative mentoring programs to promote gender equity in academic medicine. *Academic Medicine, 76*(1), 39-42.

Marsh, G. (2014). Institutional characteristics and student retention in public 4-year colleges and universities. *Journal of College Student Retention: Research, Theory & Practice, 16*(1), 127-151.

McFarland, K. K., Reinhardt, J. W., & Yaseen, M. (2010). Rural dentists of the future: Dental school enrollment strategies. *Journal of Dental Education, 74*(8), 830-835.

McKinnon, M., Luke, G., Bresch, J., Moss, M., & Valachovic, R. W. (2007). Emerging allied dental workforce models: Considerations for academic dental institutions. *Journal of Dental Education, 71*(11), 1476-1491.

McLaughlin, J. E., McLaughlin, G. W., McLaughlin, J. S., & White, C. Y. (2016). Using Simpson's Diversity Index to examine multidimensional models of diversity in health professions education. *International Journal of Medical Education, 7*, 1-5. doi:10.5116/ijme.565e.1112

Mencarini, L. (2014). Gender equity. In A. C. Michalos (Ed.), *Encyclopedia of quality of life and well-being research* (pp. 2437-2438). Dordrecht: Springer Netherlands. doi:10.1007/978-94-007-0753-5_1131

Mertz, E. A. (2016). The dental-medical divide. *Health Affairs (Project Hope), 35*(12), 2168-2175. doi:35/12/2168 [pii]

More, E. S. (1999). *Restoring the balance: Women physicians and the profession of medicine, 1850-1995*. Cambridge, MA: Harvard University Press.

Munz, S. M., Kim, R. Y., Holley, T. J., Donkersloot, J. N., & Inglehart, M. R. (2017). Dental hygiene, dental, and medical students' OMFS/hospital dentistry-related knowledge/skills, attitudes, and behavior: An exploration. *Journal of Dental Education, 81*(2), 149-161. doi:81/2/149 [pii]

National Center for Education Statistics. (2017a). CIP user site. Retrieved from http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55

National Center for Education Statistics. (2017b). The Integrated Postsecondary Education Data System - home page. Retrieved from http://nces.ed.gov/ipeds/

National Center for Education Statistics. (2017c). National Center for Education Statistics (NCES) home page. Retrieved from http://nces.ed.gov/

Nora, L. M., McLaughlin, M. A., Fosson, S. E., Stratton, T. D., Murphy-Spencer, A., Fincher, R. E., . . . Witzke, D. B. (2002). Gender discrimination and sexual harassment in medical education: Perspectives gained by a 14-school study. *Academic Medicine, 77*(12), 1226-34.

Oakley, A. (2015). *Sex, gender and society* (revised edition ed.). London, United Kingdom: Routledge.

Office of Civil Rights. (2012). *Gender equity in education.* (No. 2017). Washington, DC: U.S. Department of Education.

Okahana, H., Feaster, K., & Allum, J. (2016). *Graduate enrollment and degrees: 2005 to 2015*. Washington, DC: Council of Graduate Schools.

Orenstein, R. (2017). History of osteopathic medicine: Still relevant? *The Journal of the American Osteopathic Association, 117*(3), 148. doi:10.7556/jaoa.2017.027

Oxford English Dictionary. (2017a). Sex. Retrieved from http://www.oed.com/

Oxford English Dictionary. (2017b). Gender. Retrieved from http://www.oed.com/

Pruthi, R., & Nielson, M. (2013). Age, gender, and the urology work force: Evolving trends. Retrieved from http://urologytimes.modernmedicine.com/urology-times/content/tags/career/age-gender-and-urology-work-force-evolving-trends?page=full

Ramsbottom-Lucier, M., Johnson, M. M. S., & Elam, C. L. (1995). Age and gender differences in students' preadmission qualifications and medical school performances. *Academic Medicine, 70*(3), 236-39.

Reichenbach, L., & Brown, H. (2004). Gender and academic medicine: Impacts on the health workforce. *BMJ: British Medical Journal, 329*(7469), 792-795.

Rose, S. H., Burkle, C. M., & Elliott, B. A. (2006). Trends in gender distribution among anesthesiology residents: Do they matter? *Anesthesia & Analgesia, 103*(5), 1209-1212. doi:10.1213/01.ane.0000238448.64040.20

Sanfey, H. A., Saalwachter-Schulman, A., Nyhof-Young, J., Eidelson, B., & Mann, B. D. (2006). Influences on medical student career choice: Gender or generation? *Archives of Surgery, 141*(11), 1086-1094.

Scarbecz, M., & Ross, J. (2002). Gender differences in first-year dental students' motivation to attend dental school. *Journal of Dental Education, 66*(8), 952-961.

Sewell, J., Hawley, N., Kingsley, K., O'Malley, S., & Ancajas, C. C. (2008). Recent admissions trends at UNLV-SDM: Perspectives on recruitment of female and minority students at a new dental school. *Journal of Dental Education, 72*(11), 1261-1267.

Sharpe, W. (2017). Education world: Single-gender classes: Are they better? Retrieved from http://www.educationworld.com/a_curr/curr215.shtml

Stetser, M., & Stillwell, R. (2014). *Public high school four-year on-time graduation rates and event dropout rates school years 2010-2011 and 2011-2012*. Washington, DC: U.S. Department of Education.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston, MA: Pearson.

Tesch, B. J., Wood, H. M., Helwig, A. L., & Nattinger, A. B. (1995). Promotion of women physicians in academic medicine. Glass ceiling or sticky floor? *JAMA, 273*(13), 1022-1025.

Tsugawa, Y., Jena, A. B., Figueroa, J. F., Orav, E., Blumenthal, D. M., & Jha, A. K. (2017). Comparison of hospital mortality and readmission rates for Medicare patients treated by male vs female physicians. *JAMA Internal Medicine, 177*(2), 206-213. doi:10.1001/jamainternmed.2016.7875

Tucker, S. I. (2015). Three men and a maybe: Identity and privilege in male preservice elementary school teachers. *The Journal of Men's Studies, 23*(1), 3-20. doi:10.1177/1060826514561988

U.S. Census Bureau. (2017). Age and sex composition: 2010. Retrieved from https://www.census.gov/prod/cen2010/briefs/c2010br-03.pdf

U.S. Department of Health and Human Services. (2013). *The U.S. health workforce chartbook part I: clinicians*. Rockville, MD: U.S. Department of Health and Human Services, , Health Resources and Services Administration, National Center for Health Workforce Analysis.

Udry, J. R. (1994). The nature of gender. *Demography, 31*(4), 561-573. doi:10.2307/2061790

Valian, V. (1999). *Why so slow? The Advancement of Women*. Cumberland, RI: The MIT Press.

Vassar, L. (2015). How medical specialties vary by gender. Retrieved from https://wire.ama-assn.org/education/how-medical-specialties-vary-gender

Verdonk, P., Benschop, Y. W. M., de Haes, H. C. J. M., & Lagro-Janssen, T. L. M. (2009). From gender bias to gender awareness in medical education. *Advances in Health Sciences Education, 14*(1), 135-152.

Voracek, M., Tran, U., Fischer-Kern, M., Formann, A., & Springer-Kremser, M. (2010). Like father, like son? Familial aggregation of physicians among medical and psychology students. *Higher Education: The International Journal of Higher Education and Educational Planning, 59*(6), 737-748.

Walsh, M. R. (1977). *Doctors wanted, no women need apply*. New Haven, CT: Yale University Press.

Wanchek, T., Cook, B. J., Anderson, E. L., & Valachovic, R. W. (2016). Annual ADEA survey of dental school seniors: 2015 graduating class. *Journal of Dental Education, 80*(5), 612-629.

Wayne, N. L., Vermillion, M., & Uijtdehaage, S. (2010). Gender differences in leadership amongst first-year medical students in the small-group setting. *Academic Medicine: Journal of the Association of American Medical Colleges, 85*(8), 1276-1281.

Wheat, J. R., Brandon, J. E., Carter, L. R., Leeper, J. D., & Jackson, J. R. (2003). Premedical education: The contribution of small local colleges. *Journal of Rural Health, 19*(2), 181-89.

WHO (2017b). What do we mean by "sex" and "gender"? Retrieved from http://apps.who.int/gender/whatisgender/en/

Williams, J. A. (2013). Girls can be anything . . . but boys will be boys: Discourses of sex difference in education reform debates. *Nevada Law Journal, 13*(2)

Wilson, J. A., Zozula, C., & Gove, W. R. (2011). Age, period, cohort and educational attainment: The importance of considering gender. *Social Science Research, 40*(1), 136-149. doi:10.1016/j.ssresearch.2010.09.011

Women Chairs of the Association of Medical School Pediatric Department Chairs. (2007). Women in pediatrics: Recommendations for the future *Pediatrics, 119*(5), 1000-1005. doi:119/5/1000

Yuan, J. C., Lee, D. J., Kongkiatkamon, S., Ross, S., Prasad, S., Koerber, A., & Sukotjo, C. (2010). Gender trends in dental leadership and academics: A twenty-two-year observation. *Journal of Dental Education, 74*(4), 372-380. doi:74/4/372

Zorek, J., & Raehl, C. (2013). Interprofessional education accreditation standards in the USA: A comparative analysis. *Journal of Interprofessional Care, 27*(2), 123-130.

APPENDICES

APPENDIX A

INSTITUTIONS INCLUDED IN THE STUDY

A T Still University of Health Sciences
Alabama College of Osteopathic Medicine
Albany Medical College
Augusta University
Baylor College of Medicine
Boston University
Brown University
Case Western Reserve University
Columbia University in the City of New York
Creighton University
Dartmouth College
Des Moines University-Osteopathic Medical Center
Drexel University
Duke University
East Carolina University
East Tennessee State University
Eastern Virginia Medical School
Edward Via College of Osteopathic Medicine
Emory University
Florida Atlantic University
Florida International University
Florida State University
George Washington University
Georgetown University
Harvard University
Hofstra University
Howard University
Icahn School of Medicine at Mount Sinai
Indiana University-Purdue University-Indianapolis
Johns Hopkins University
Kansas City University of Medicine and Biosciences
Lake Erie College of Osteopathic Medicine
Lincoln Memorial University
Loma Linda University

Louisiana State University Health Sciences Center-New Orleans
Louisiana State University Health Sciences Center-Shreveport
Loyola University Chicago
Marian University
Marquette University
Marshall University
Mayo Medical School
Medical College of Wisconsin
Medical University of South Carolina
Meharry Medical College
Mercer University
Michigan State University
Midwestern University-Downers Grove
Midwestern University-Glendale
Morehouse School of Medicine
New York Institute of Technology
New York Medical College
New York University
Northeast Ohio Medical University
Northwestern University
Nova Southeastern University
Oakland University
Ohio State University-Main Campus
Ohio University-Main Campus
Oklahoma State University Center for Health Sciences
Oregon Health & Science University
Pacific Northwest University of Health Sciences
Pennsylvania State University-College of Medicine
Philadelphia College of Osteopathic Medicine
Ponce School of Medicine and Health Sciences
Quinnipiac University
Rocky Vista University
Rosalind Franklin University of Medicine and Science
Roseman University of Health Sciences
Rowan University
Rush University
Rutgers University-New Brunswick
Saint Louis University
San Juan Bautista School of Medicine
Southern Illinois University-Carbondale
Southern Illinois University-Edwardsville
Stanford University
Stony Brook University

SUNY Downstate Medical Center
Temple University
Texas A & M University-College Station
Texas Tech University Health Sciences Center
The Commonwealth Medical College
The University of Tennessee-Health Science Center
The University of Texas Health Science Center at Houston
The University of Texas Health Science Center at San Antonio
The University of Texas Medical Branch
Thomas Jefferson University
Touro College
Touro University California
Touro University Nevada
Tufts University
Tulane University of Louisiana
Universidad Central Del Caribe
University at Buffalo
University of Alabama at Birmingham
University of Arizona
University of Arkansas for Medical Sciences
University of California-Davis
University of California-Irvine
University of California-Los Angeles
University of California-San Diego
University of California-San Francisco
University of Central Florida
University of Chicago
University of Cincinnati-Main Campus
University of Colorado Denver/Anschutz Medical Campus
University of Connecticut
University of Detroit Mercy
University of Florida
University of Hawaii at Manoa
University of Idaho
University of Illinois at Chicago
University of Iowa
University of Kansas
University of Kentucky
University of Louisville
University of Maryland Baltimore
University of Massachusetts Medical School Worcester
University of Miami
University of Michigan-Ann Arbor

University of Minnesota-Duluth
University of Minnesota-Twin Cities
University of Mississippi
University of Missouri-Columbia
University of Missouri-Kansas City
University of Nebraska Medical Center
University of Nevada-Las Vegas
University of Nevada-Reno
University of New England
University of New Mexico-Main Campus
University of North Carolina at Chapel Hill
University of North Dakota
University of North Texas Health Science Center
University of Oklahoma-Health Sciences Center
University of Pennsylvania
University of Pikeville
University of Pittsburgh-Pittsburgh Campus
University of Puerto Rico-Medical Sciences
University of Rochester
University of South Alabama
University of South Carolina-Columbia
University of South Dakota
University of South Florida-Main Campus
University of Southern California
University of Texas Southwestern Medical Center
University of the Pacific
University of Toledo
University of Utah
University of Vermont
University of Virginia-Main Campus
University of Washington-Seattle Campus
University of Wisconsin-Madison
Upstate Medical University
Vanderbilt University
Virginia Commonwealth University
Virginia Tech Carilion School of Medicine
Wake Forest University
Washington State University
Washington University in St Louis
Wayne State University
Weill Cornell Medical College
West Virginia School of Osteopathic Medicine
West Virginia University

Western University of Health Sciences
William Carey University

APPENDIX B

DATA DICTIONARY

IPEDS Data File Name	Description	IPEDS Survey Source	Variable Type	Research Question	Survey Year
UNITID	Unit ID	Institutional Characteristics	Independent	Descriptive	2014-2015
NAME	Institution Name	Institutional Characteristics	Independent	Descriptive	2014-2015
CTOTALT CIPCODE= 51.04	Grand total (First major Dentistry Degrees/certificates total)	Completers	Independent	2,4,5	2014-2015
CTOTALM CIPCODE= 51.04	Grand total men (First major Dentistry Degrees/certificates total)	Completers	Independent	2,4,5	2014-2015
CTOTALW CIPCODE= 51.04	Grand total women (First major Dentistry Degrees/certificates total)	Completers	Independent	2,4,5	2014-2015
CTOTALT CIPCODE= 51.12	Grand total (First major Medicine Degrees/certificates total)	Completers	Independent	1,3,5	2014-2015
CTOTALM CIPCODE= 51.12	Grand total men (First major Medicine Degrees/certificates total)	Completers	Independent	1,3,5	2014-2015
CTOTALW CIPCODE= 51.12	Grand total women (First major Medicine Degrees/certificates total)	Completers	Independent	1,3,5	2014-2015
CTOTALT CIPCODE= 51.19	Grand total (First major Osteopathic Medicine/Osteopathy Degrees/certificates total)	Completers	Independent	1,3,5	2014-2015
CTOTALM CIPCODE= 51.19	Grand total men (First major Osteopathic Medicine/Osteopathy Degrees/certificates total)	Completers	Independent	1,3,5	2014-2015
CTOTALW CIPCODE= 51.19	Grand total women (First major Osteopathic Medicine/Osteopathy Degrees/certificates total)	Completers	Independent	1,3,5	2014-2015
OBEREG	Bureau of Economic Analysis (BEA) Regions	Institutional Characteristics	Dependent	1,2,3,4,5	2014-2015

HOSPITAL	Institution has hospital	Institutional Characteristics	Dependent	1,2,3,4,5	2014-2015
CONTROL	Control of institution	Institutional Characteristics	Dependent	1,2,3,4,5	2014-2015
CCBASIC	Carnegie Classification 2010: Basic	Institutional Characteristics	Dependent	1,2,3,4,5	2014-2015
LOCALE	Degree of urbanization (Urban-centric locale)	Institutional Characteristics	Dependent	1,2,3,4,5	2014-2015
INSTSIZE	Institution size category	Institutional Characteristics	Dependent	1,2,3,4,5	2014-2015
PCTENRAN	Percent of total enrollment that are American Indian or Alaska Native	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015
PCTENRAP	Percent of total enrollment that are Asian/Native Hawaiian/Pacific Islander	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015
PCTENRAS	Percent of total enrollment that are Asian	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015
PCTENRBK	Percent of total enrollment that are Black or African American	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015
PCTENRNH	Percent of total enrollment that are Native Hawaiian or Other Pacific Islander	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015
PCTENRHS	Percent of total enrollment that are Hispanic/Latino	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015
PCTENRWH	Percent of total enrollment that are White	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015
PCTENRUN	Percent of total enrollment that are Race/ethnicity unknown	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015
PCTENRNR	Percent of total enrollment that are Nonresident Alien	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015
PCTENR2M	Percent of total enrollment that are two or more races	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015
PCTENRW	Percent of total enrollment that are two or more races	Fall Enrollment	Dependent	1,2,3,4,5	2014-2015

APPENDIX C

IRB APPROVAL LETTER

THE UNIVERSITY OF ALABAMA | Office of the Vice President for Research & Economic Development
Office for Research Compliance

September 1, 2017

William Bryant Faust
College of Education
Box 870231

Re: "Institutional Characteristics that Explain Differences by Gender in Medical and Dental Degree Production"

Dear Mr. Faust:

This letter comes as a response to your communication received August 25, 2017. According to the Office for Human Research Protection (OHRP) under policy 45 CFR 46.101 the proposed work is not human subjects research.

Because the work is not considered human subjects research, it does not require IRB approval and is therefore excluded from review by the IRB.

If you have any questions or if I can be of further assistance please do not hesitate to contact me.

Sincerely,

[redacted]

Carpantato T. Myles, MSM, CIM, CIP
Director & Research Compliance Officer

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